MODERN MECHANICS

AND INVENTIONS

DEC 25¢

SEE PAGE 98

STEWART ROUSE

HENRY FORD TELLS YOU WHAT TO INVENT

Start to Play Very First Day

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What greater gift can you confer on your children this year than lifelong fun and entertainment?

Love of music means love of home, an appreciation of the finer things in life. Here is a chance to give your boy or girl that love without the tedious practice that most instruments require. The Xylorimba is *easy* to play. No teacher is needed. Practice is actually a joy.

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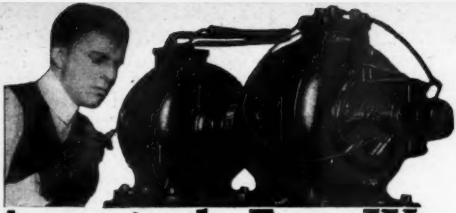

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DECEMBER, 1929

TABLE of CONTENTS

Special Features

Henry Ford Tells You What to Invent - 44
As told to M. K. Wisehart by Henry Ford

Deadly Weapons of the Next War - - 50
By James Nevin Miller

Science Beats Brawn in Football - - - 70
By Kenneth Haycraft, All-American End

How Skilled Birdmen Get Lost in the Air - 74
By Major H. H. Arnold

Deep Sea Devils Trapped by Science - - 84

Houdini's Mystifying Magic Stunts Exposed 92
By R. D. Adams
The Mechanic who made Houdini's Magic Apparatus

Tricks That Trap Mail Thieves - - - 104
By C. Moran

Color "Tele-Talkies" Latest Radio Feat - 118

Miniature Houses Made From Paper - - 126

Easy Stunts With Paper - - - - - 162
By Keenan H. Ward

Three Great "How-to-Build" Articles

How to Build the "Baby Bullet" - - - 142
By Stewart Rouse

Building "Miss Modern Mechanics" - - 166
By Howard Holbrook

A Bandsaw from Old Auto Parts - - - 171
By T. S. Allen

Interesting Features

Graphic Section - - - - - - - 57
Advances in the World of Science

Tips on Shooting for the Duck Hunter - 66
By Tom Kennedy, Firearms Expert

Cellular City of Tomorrow - - - - - 78

Patents—Nutty or Novel? - - - - - 82

Boomerang Throwers Show Amazing Skill 112

(Continued on page 6)

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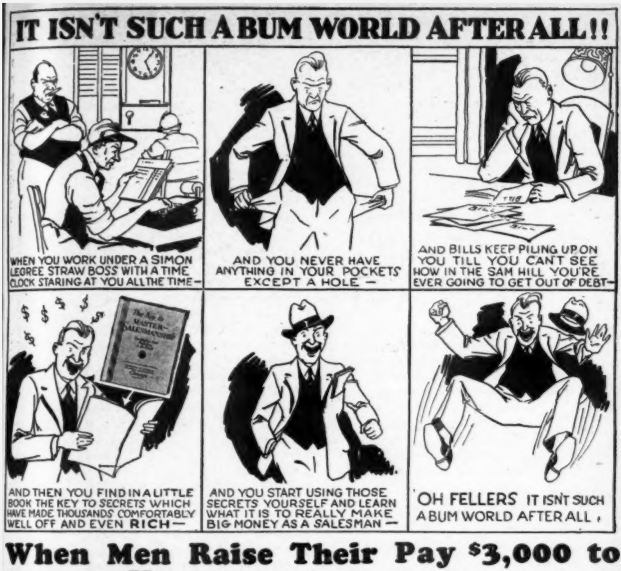

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Aviation

Tandem Airplane Invented for Heavy Loads - 56
Airplane to Run on Hydrogen from Air - - 65
Plane Talk Department - - - - - 88
Edited by Major H. H. Arnold
Four Types of Army Warplanes - - - 90
125-Passenger Airplane Planned - - - 97
Deer Hunted by Airplane in Hawaii - - 97
12-Motored Plane Groomed for Ocean Flight 98
Win Your Wings at Our Expense - - 102
Model Airplane Contest Winners - - - 107
Airplanes Carry Supplies in Gold Rush - 110
Shot Gun Shell Starts Airplane Engine 111
How I Am Winning My Wings - - - 138
By Fred Resico, Jr., Winner of Modern Mechanics' "Win Your Wings" Contest

For the Radio Fan

Radio Follows Bird Migration - - - 80
Finding Oil by Radio New Scientific Feat 99
Self-Tuning Radios Fans' Choice in 1930 - 108
Sparks From the Radio Editor - - - 122
Edited by L. B. Robbins
New Travel-R Sets Last Word in Portability 122
Device Tests Battery Water Purity - - 123
Making Your Own B Batteries - - - 124
Servicing Cradle Saves Time in Repairing 125

For Craftsmen, Young and Old

Amateur Electrician - - - - - - 154
Edited by Theodore Allen
Automatic Electric Cigarette Lighter - - 154
Making a Horn From Old Parts - - - 155
Digging a Pirate's Cave - - - - - 156
By Hi Sibley
Boy's Workbench - - - - - - - 158
Edited by A. Neely Hall
Doorstep Kennel for Your Dog - - - 158
Gun Rack or Storage Cabinet - - - 159
Making a Table-Tennis Set - - - - 160
Vest Pocket Railway Has 2-Mile Trackage 161

Interesting Items

Sails for Bicycles Save Legs - - - - 56
Aluminum Dust Makes Hot Flame - - - 56
New Hot Dog Stands Are Artistic - - - 68
Ash Receiver on Gear Shift Lever - - 80
Largest Saxophone Seven Feet Tall - - 81
$4,000 for Bark of One Tree - - - 81
New Toaster Works Automatically - - 98
Sun Baths Pep Up Weary Congressmen - 101
Chimpanzee Runs Zoo Switchboard - - 101
Cop Directs Traffic in Water - - - 110
Architects Build Models to Sell Houses - 111
Toy Bungalow Fashioned From Scraps - 115
Unusual House Built in Shape of Elephant 116
400-Ton Marble Slab Quarried at Carrara 116
Mammoth Camera Towed on Auto - - - 169
Ford Motor Made Into Seagoin' Flivver - 173

Handikinks

Oil Barrel Makes Back Yard Incinerator - 130
Wood Clamps From Old Ford Parts - - 130
Tile Pipe Drinking Fountain - - - 130
Preserving Key Forms - - - - - 130
Soldering Kit for Use with Spirits Lamp - 131
Handy Sawhorse Tool Case - - - - 131
Mottled Metal Finish Produced With Valve 132
Forge Blower From Separator - - - 132
Motor Mounting Keeps Belt Tight - - 132
Auger Bit as Valve Grinding Tool - - 132
Emergency Pulley - - - - - - 132
Concrete-Filled Pans Make Dumb-bells - 133
Bottle Cork as Handy Pen Filler - - - 133
Emergency Fuse From Socket Plug - - 133
Device Deadens Saxophone Vibration - 133
Auto Seat Springs Protect Light Bulbs - 133
Guide Aids in Blowtorch Cutting - - - 134
Toaster Keeps Glue Pot Warm - - - 134
Muffin Tins Hold Nails in Cabinet - - 134
Shop Carrier for Washers and Nuts - - 134
Home Made Soft Nose Hammer - - - 134
Efficient Forge From Old Oil Drum - - 135
Ford Starter Runs Emery Wheel Grinder - 135
Use Half of Mirror for Sling Shot Handle 135
Home Made 1000-Watt Light - - - - 135
Lighting the Gas Jet With Your Finger Tip 136
Device Loosens Screw Caps on Jars - - 136
Redwood Block Makes Neat Fireplace Poker 136
Auto Crankcase Catches Water Overflow - 136
Disk Wheel Makes Coal Chute Cover - - 137
Hook Recovers Cork From Inside Bottle - 137
Making the Percolator Drip-Proof - - 137
Funnel Twine Holder - - - - - - 137
Convenient Kitchen Chopping Board - - 137

For the Motorist

Six-Wheeled Car Defies Chuckholes - - 68
Novel Trailer for Camping Out - - - 80
Glenn Curtiss Designs Fast Aero-Car - - 100
Toy-Size Car Develops 67-Mile Speed - 117
Driving Light Turns With Steering Wheel 169
Unusual Features of Front-Drive Car - - 174
Motor Mechanics - - - - - - - 175
Edited by Ray F. Kuns
How to Start Your Car in Cold Weather - 176
Extra Wire Wheel Carrier - - - - 178
Improved Puncture Testing Outfit - - 178

New Mechanical Inventions

Headphones Enable Deaf to Hear Talking Pictures - - - - - - - - - 55
World's Smallest Fire Engine - - - - 55
Rocket Sleds Develop High Speeds - - 69
Fast Ice Boat Built From Ford Engine - 81
Rugs Designed for Indoor Golf Poker - 117
Bicycle Rowboat Uses Hand and Foot Power 173

Cover Design Painted by Stewart Rouse

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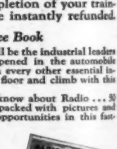

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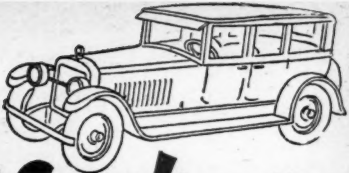

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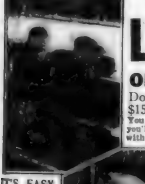

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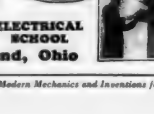

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McSweeny Electrical Schools,
Dept. E-13-M, Cleveland, Ohio.
Dear Mac: Without obligation send me a copy of your big free book on ELECTRICITY; also details of remarkable tuition offer and complete radio course.

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WELL, sir, the Hangar Gang finds itself back in the good ship MODERN MECHANICS this month! And for a starter let's mention the fact that the FLYING MANUAL with the dope on seaplane floats for light ships, the Wagle 3-cylinder motor, *all* of the Baby Bullet article and the hot cargo of fine things we've promised you Hangar Hounds is now on sale at your local newsstand. Trot around and take a look at the finest amateur's aviation textbook in the country. Wing curves, design dope—everything from soup to nuts in the MANUAL. Get your copy now.

Airplane builders are still writing in to us enclosing their dollars for copies of the first MANUAL, with its fine plans for building the Heath Parasol, the Russell sportplane and the Alco monoplane.

That's about all the back patting we want to do before we spread a few letters out for you. Here's one from Waseca, Sask.

Dear Sirs: Am a regular reader of your "mag" and am here to say that there is none like her. I like the way you are pushing aviation for the beginner. I am so air-minded that were I any more so, my cranium would hold nothing but air!

My whole trouble though is lack of funds. How about some workable plans on an inexpensive flying boat something like that shown in your April issue for "penguin" flying in sheltered waters, which could be flown with a converted motorcycle engine of amateur "souping up"? A plane using the wing of one of the planes such as the Alco or Heath with a simple stick and wire single member, similar to the Duede or Northrop glider, in place of a regular fuselage and one or two pontoons of simple construction and a basket seat arrangement for the pilot.

Although taking off and landing a "flying boat" is harder than that of the land plane, I imagine there would be less danger of smashing the ship or injuring the pilot if the old "souped up" motor should "conk" while flying over water. I already have a motorcycle engine which is in fair shape and have access to a lake about seven miles long and one mile wide, so if I could get some plans or working instructions for something like the aforementioned that could be built for around a hundred dollars or so I sure would have a crack at it.

Even if I did come a cropper a few times in the middle of the lake, half a mile is nothing for me to swim and the plane crashing into water is not so liable to be so badly wrecked as on land, I should think. How about it? Am I right? Incidentally, how about some tips on the idiosyncrasies (Gene Shank said he ought to get a whole nickel for that word so I ought to get about two cents and a half anyway) of hydroplane flying? If you can't publish anything like all the aforementioned in the very near future tell me if there is anywhere that I could procure something of this nature and if I can't get anything already laid out for me, by golly, I'll soup up some of my own!

Here's to the limit of luck and success for you and your "mag".

Your air cuckoo,

W. L. COTTON.

Whoops! Looks like Mistah Cotton expects to do some swimming with his flying. We wrote the following letter in answer:

Dear Mr. Cotton:

Your interesting letter prompts us to save it for the Shop Mail Box, and our answer here is brief. We can't say we exactly recommend the Penguin flying boat, as the power is so limited. We suggest for water flying you use floats on some such ship as the Heath, the Alco, Russel or Lincoln. See Sam Rabl's article in the 1930 Edition of the Flying Manual.

The Editors.

Thank You for Mentioning Modern Mechanics and Inventions for December When Writing to Advertisers

PARKS MAKES IT EASY

In other days the education of a competent, well-rounded aviation mechanic was a long and painful process. Years of work on inadequate flying equipment, odd jobs about the flying field, long hours of labor in blistering summer and the coldest winter weather, in flimsy, inadequate shops—all these went into the education of the man behind the man who flies the plane.

There's a Difference Now

The aviation mechanic of today—if he's a Parks-trained man—has learned in a few short months more than his experience-educated brother learned in years. He's a well-rounded, highly educated, smart and competent workman. He can tune an engine, weld metal, build wings, make cowlings and other sheet metal parts, assemble an airplane, overhaul its engine, "shoot trouble" on the most complicated power plant, dope and paint wings and fuselages—in short, do any task that goes into the manufacture or the maintenance of an airplane.

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They fit easily into any organization, either in the factory or on the line. Because they are broadly trained they are ideal material for chief mechanic or factory foreman. Because they are so highly specialized they fit equally well into the job of line mechanic or any other post that requires a close and thorough knowledge of airplanes and engines. They have been trained in that is internationally recognized as the finest mechanics school in the world—in buildings that are as modern and as fully equipped as the most up-to-date airplane factories. They have been educated in the largest flying school in the world—rubbed shoulders with hundreds of flyers and achieved an appreciation of the flyer's viewpoint that few mechanics ever get. They have been trained to work on flying equipment that is "on the fly" daily from dawn to dark. They have received their knowledge from instructors who are veterans in the flying game—teaching experts with a record of turning out hundreds of successful mechanics.

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It's not hard to make your way to success in aviation if you travel the Parks way. Only remember this—TODAY is the time to enter aviation. TODAY is the day to start in this amazingly wealthy industry. The coupon below will get you on your way. Fill it out and get it in the mail—NOW—just as soon as you lay this book down.

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A Few More Interesting Letters Selected at Random from the Mail Bag

A rip roaring sort of a fan is I. R. H. of Mobile. Looks like he thinks the Lincoln sportplane (if you'll pardon us for a minute for talking airplanes first) is quite the keen thing. Here's what he has to say:

Dear Editor! Atta boy, go get them; live up to your name by getting ALL the MODERN news worth knowing. I have been an ardent reader of another magazine of mechanics but this month I wasted my money. All the news they had was as old as yesterday's newspaper. From now on I will put that money in the bank. And please don't waste your valuable space on any second hand news either. Use that space for the Lincoln. Speaking of the Lincoln, won't you kindly explain the wing-section. I ain't much of an engineer and the drawing being split makes it still worse to read. Won't you give me the dimensions or tell me where I can get some life size ordinates? You would oblige me greatly. I couldn't get in the Win Your Wings contest because I couldn't get a hold of the name of the Hat in Ring Ace but you can bet I will be in the Model contest, as I have under construction a small metal plane that I expect will fly, though it remains to be seen. Last but not least, I sure do like your "The Why of It."

Yours for Modern News,
I. R. H.

We have had many compliments on the "Why of It" feature. More of these interesting pages are on the way, showing how Germans take tissue paper which burns without smoke or taste, inoculate it with nicotine, and, presto! there you have synthetic cigarettes. Wait and see, I. R. H. To paraphrase your breezy style, you ain't seen nothin' yet! For the benefit of the Gang we are publishing our reply.

Dear I. R. H. The U. S. A. 27 wing ordinance, obtainable from the National Advisory Committee of Aeronautics, Navy Building, Washington, D. C., will be run in the "Shop Mailbox" accompanying your letter.

Glad you like Modern Mechanics. We are doing everything possible to improve on our already high standard.

Yours truly,
The Editors.

◇◇◇

INTEREST in the fighting planes of the great war never will abate, if the editors are to judge from the letters which come in asking for information on the Spads and Nieuports and Fokkers which made history in the skies a decade ago. There is a fascination about the very name of Spad which can never attach itself to a present-day commercial plane, regardless of the latter's superior speed or performance. The Spad is legend; today's airplanes are merely airplanes. The following letter comes from an Indiana reader:

Dead Editor:

In a recent issue of Modern Mechanics I read that the Fokker triplane was capable of a speed of 118 miles an hour, the Fokker D-VII did 121 miles an hour, the Spad attained a speed of 124 miles an hour, the Nieuport did 120 and the SE-5 119. Will you please tell me their powerplants (horsepower, cylinders, etc.) and any additional information you have about them? Wasn't there a Spad 220?

Sincerely yours,
GEORGE HURST.

312 North Noble St.,
Shelbyville, Indiana.

Mr. Hurst's letter was answered by Major H. H. Arnold, editor of MODERN MECHANICS' plane talk department, as follows:

Dear Mr. Hurst:

Following information is furnished you in response to your letter of July 10th.

During the World War the development of airplanes and engines progressed rapidly. Accordingly, it is not possible to state that any one airplane was equipped with but one engine. Approved types of engines were installed in airplanes after they passed the experimental stage.

The following will give you an idea of the powerplants of the various Pursuit planes:

Nieuport—Gnome rotary engine, 9 cylinders, 160 h. p.

Nieuport—Clerget rotary engine, 9 cylinders, 140 h. p.

Nieuport—Clerget rotary engine, 11 cylinders, 200 h. p.

SE-5—Hispano-Suiza, V-type engine, 8-cylinders, 180 h. p.

SE-5—Hispano-Suiza, V-type engine, 8 cylinders, 220 h. p.

Spad—Same power plants as in SE-5.

Fokker D-7—Benz, Mercedes and B. M. W. vertical type engines, all of six cylinders, ranging from 180 to 185 h. p.

Fokker Tri-Plane—Ober-Ursel rotary engine, 9 cylinders, 110 h. p.

Fokker Tri-Plane—Ober-Ursel rotary engine, 11 cylinders, 160 h. p.

In addition to the engines listed above for the Nieuport, there were some few equipped with LeRhone 110 and 200 h. p. engines.

Trusting that this furnishes you the information you desire, I am

Yours sincerely,
H. H. ARNOLD,
Major, Air Corps.

now! take your place in AVIATION

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"FLY YOURSELF"

LET THIS WORLD-WAR FLYER TRAIN YOU AT HOME

Major Robert L. Rockwell stands high in the Aviation history of the World War. He is now devoting himself to helping men get the right start in Aviation. Let him train you for this great new industry and your future in Aviation is assured.

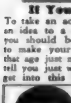
MAJOR ROBERT L. ROCKWELL *Says...*

GET YOUR GROUND SCHOOL INSTRUCTION *AT HOME*

If You Are Under 48

To take an active part in Aviation, with an idea to a real future ahead of you, you should be under 48 years of age to make your start. If you are under that age just mail the coupon and I will tell you just what I can do to help you get into this fascinating big pay field.

My home-study course is compiled to prepare you in the fundamental knowledge of Aviation necessary to rapid progress. Without leaving your present job or spending a lot of money, you can, in a few short months, complete my home-study course and equip yourself with a solid foundation of Aviation knowledge required before flying, or filling any well-paid ground job.



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Dear Major: Your excellent advice prevented me from taking up Aviation the wrong way when I wanted to learn flying first. After I had completed your ground course, which thoroughly prepared me in the principles of flight, I was able to solo in 7 hours. I always will be glad to tell anyone that I am a Rockwell trained man.

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I train men right along for jobs as mechanics, riggers, electricians, welders, plane and motor inspectors, airport operators, radio experts, aerial photographers, transport managers and salesmen. Due to the demand for trained men it is easy for me to give you employment assistance.

Pay FOR YOUR FLYING TRAINING *with your* GROUND JOB EARNINGS

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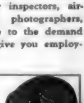
Dear Major:—The main thing about your individual method of instruction is that you not only gave me a thorough knowledge of Aviation, but you also showed me how to capitalize on what I learned. I am now General Manager for International Air Surveys and making three times what I ever earned before. I will always be a booster for your method of training.

FLOYD PROTHERO.



If you have not the ready cash for flying instruction after completing my home study course, I will get you a job at a hangar where you can pay for your flying instruction out of your ground job earnings. But, whether you pay for your flying instructions or earn it, the important thing is to get started with your preliminary training at once.

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Desk S-2 **Dayton, Ohio**

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If you are earning a penny less than $50 a week, send for my book of information on the opportunities in Radio. It's FREE. Clip the coupon NOW. A flood of gold is pouring into Radio creating hundreds of big pay jobs. Why go along at $25, $30 or $45 a week when the good jobs in Radio pay $50, $75, and up to $250 a week? "Rich Rewards in Radio" gives full information on these big jobs and explains how you can quickly learn Radio through my easy, practical homestudy training.

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The amazing growth of Radio has astounded the world. In a few short years three hundred thousand jobs have been created. And the biggest growth is still to come. That's why salaries of $50 to $250 a week are not unusual. Radio simply hasn't got nearly the number of thoroughly trained men it needs.

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I teach you to begin making money shortly after you enroll. My new practical method makes this possible. I give you SIX BIG OUTFITS of Radio parts and teach you to build practically every type of receiving set known. M. E. Sullivan, 412 73rd St., Brooklyn, N. Y., writes, "I made $720 while studying." G. W. Page, 1807 21st Ave. S., Nashville, Tenn., "I picked up $935 in my spare time while studying."

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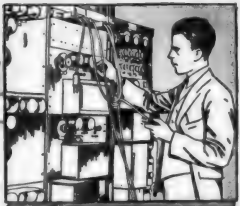
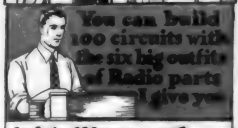
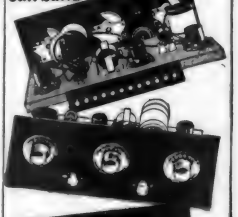




3 of the 100 you can build



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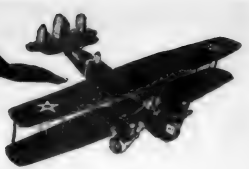

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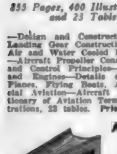

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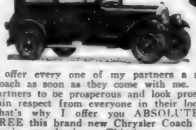

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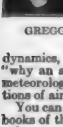

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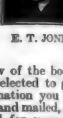

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by Willis Ray Gregg, Senior Meteorologist in charge of Aerological Division U. S. Weather Bureau. **144 pages, 44 illustrations, $2.50**

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R. J. Smith, 522 N. Mich. Ave., Big Rapids, Mich., makes $22 extra a week for three evenings play with a dance orchestra.

$85 a week for McCarty!

"Before taking up your course, I was making $18 weekly as a clerk and knew nothing about music, but I made my first 'paid' performance in less than eight weeks after starting. Today I owe my salary of $85 a week as a professional Tenor Banjoist to your excellent training."—Kenneth McCarty, Parkview Hotel, South Haven, Mich.

James J. Delnero, 1147 Westfield St., Springfield, Mass., makes $22 extra a week for playing with a dance orchestra.

Over $278 in Spare Time for McGriff!

"When I ordered your Tenor Banjo course I had never had my hands on a Banjo. I now have a $278 Banjo bought with extra money made by playing. Now also play weekly at the picture show and for dances at our country club, too."—J. P. McGriff, Hawkinsville, Ga.

The Book that started Lesher, McGriff and McCarty is Now Ready for YOU!

PROBABLY you're never really considered the proposition I have to offer you. Probably like thousands of others whom I have helped find themselves, you have thought of the Tenor Banjo as just a pastime—not a remarkable, melodious instrument for those who have "talent." . . . But then think of *earning* $15, $30 or $25 a week EXTRA SPARE-TIME MONEY for two, three or four nights' *fun!* Lesher, at the man pictured above. None of them had ever touched a string—ever read a single note.

I'll train you right at home to play the Tenor Banjo in 1 to 3 short months

If you can whistle a tune, read a printed page, understand a picture and hear a phonograph record—then YOU CAN Do what Lesher, McGriff and McCarty have done! Many of my students get off their first tune within half an hour after they receive the big Tenor Banjo you see pictured here. It isn't hard or tedious; instead the Play-Way is *interesting* all the way through. It's like learning a game. And *one thing* stands between you and popularity, good times, scores of new friends—and big EXTRA PAY.

Big Outfit Comes with Very First Lesson

LOOK! My Course even includes Phonograph Records

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Mail the coupon Today.

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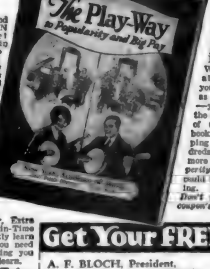

"The Play-Way to Popularity and Big Pay!"—that's the FREE book I want you to have. It will open *YOUR eyes*—just as it did for Lesher, McGriff and McCarty. Whatever you've thought about your opportunities, your advantages, your future as a Tenor Banjoist before—you'll want to think again the minute you lift the cover of this remarkable FREE book. It has been the stepping stone, the start, for hundreds who today are enjoying more fun, popularity and prosperity than they ever dreamed could be possible. It costs nothing. It may count for much. *Don't pass this page until the coupon's ready to mail.*

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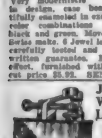

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$10 a Day besides!

YES, I'll give you your own groceries at rock-bottom, wholesale prices and a chance to pocket $10 cash earnings in a day. Just send me your name and I'll give you some money-making, money-saving facts that will amaze you. I'll show you how L. C. Van Allen, of Illinois, quit a $23-a-week job, took hold of my proposition, and shortly afterwards reported earnings of more than $100 a week. Gustav Karnath, of Minnesota—a farm laborer—made $20.35 the *first 5 hours*. Mrs. Pearl Kelley, of W. Virginia, cleared $50 the first 4 days. And Mrs. B. L. Hodges, of New York, says, "I am making more money than I ever did before—from $18 to $20 a day."

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Read what others have done with my amazing new proposition. H. C. Hanson, of North Dakota, left a drug-clerk's job and now reports earnings of $75 a week in spare time. A. Sanchez, of Colorado, who left a clothing-store job, reports profits of $4 and $5 an hour. Rachel Schryer, of Michigan, quit school-teaching and says she has made $23 in one day. I'll give you the same proposition and a wonderful chance to make big money. And I'll supply you with Groceries at Wholesale besides!

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With your groceries at wholesale and $10 a day in your pocket, you'll have plenty of cash for new clothes, house furnishings, pleasure trips, etc. And this big money is easy to get. You don't need any capital. You don't need any experience. You don't have to take any course of training. *You can start right in making money the very first day.*

$10 a Day is Easy

All you do is act as my Representative in your locality and look after my interests there. This is very easy to do. Your own home will be your headquarters. You don't have any expenses. You set your own hours and work as you please. You will get a profit on all business from your territory. All orders for my Groceries and other Household Necessities must go through your hands. I never sell to stores, so you alone get all the profits. In addition, I will supply you with Groceries, Toilet Goods and Household Necessities at our *lowest, rock-bottom wholesale prices.* Thus you will save big money as well as *make big money.*

FREE! New Ford Tudor Sedan

NOT a contest. I offer you this brand-new car as an extra reward or bonus, *in addition* to your large cash profits. Mail coupon for full information.

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Just send me your name—nothing else. I will forward all the facts of this unusual opportunity by return mail. If you want to, you can keep your present job and start in spare time. Oscar Stuart, of W. Virginia, reports $18 earnings in 2½ hours' spare time. So get the facts at once. *You have everything to gain.* It costs nothing to investigate and does not obligate you in the least.

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Besides giving you Groceries at Wholesale and a chance to clear $10 a day, I will also tell you how to get a new Ford Tudor Sedan *without paying a cent for it.* Here's an opportunity you can't afford to miss. It may mean hundreds—even thousands of dollars to you. Mail coupon now for the amazing facts!

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Like it or not, your friends and neighbors size you up by what you EARN—judged by your home and family. Why not surprise them by making good in a big way? Tell them nothing, but on the quiet fit yourself for a bigger place!

ONLY a woman knows how much a wife can suffer when her husband fails to "make the grade"—

When she dreads to meet her old school friends—when she skimps on her own appearance "so John can make a good showing at the office"—when she can't give her children things as good as the other children have, *and they ask her why.*

Brave, loyal woman, she would be the last to reproach her husband because he doesn't earn as much as other men whose wives she is thrown with constantly.

"Money isn't everything," she tells him—yet how she longs for his promotion—for that bigger salary that means better clothes, greater advantages for the children, a new car, *more of the comforts and luxuries of life!*

What can you, as an ambitious husband, do to help?

No need to ask your wife to put up a brave front—she's already doing that. No use to ask for a "raise" on the ground that you "need more money"—"raises" aren't secured that way. No big gain in devoting longer hours to your work—chances are you are already giving loyal and conscientious service.

Only one thing, then, for you to do—so important that it may prove the very turning point in your career: *you can and should compel those opportunities that quickly lead to bigger income, real success!*

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Out on the Pacific coast lived a factory man, 30 years of age—assistant superintendent of a growing plant. He enrolled for home-study training in Modern Foremanship and shortly after got together an informal class of factory executives, for discussion and study. His general manager stepped him up to production manager with a salary-increase of 125 per cent.

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Within 18 months after his enrollment in Modern Salesmanship, he stepped into the position of president and general sales manager—at a salary of $15,000 a year.

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A railroad clerk in New Jersey decided—like Jack London before him—that the only way out of a pit was *up!*

Training in Traffic Management led to a better job—then further training in Business Management helped him make good as sales manager—with a resultant salary 500 per cent larger than when he started training. Now he operates his own successful manufacturing concern.

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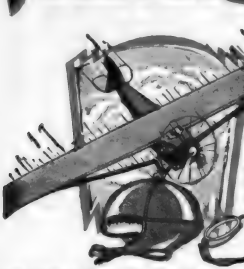
Von Hoffmann Aircraft School



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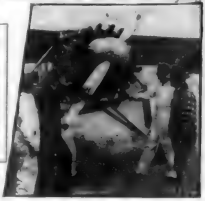

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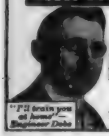

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Ship me the Corona, F. O. B. Chicago. On arrival I'll deposit $2 with express agent. If I keep the machine, I'll send you $3 a month until the $37.90 balance of $39.90 price is paid; the title to remain in you until fully paid. I am to have 10 days to try the typewriter. If I decide not to keep it, I will repack and return to express agent, who will return my $2. You are to give your standard guarantee.

Name .....

Address .....

Employed by .....

Build it for $199

Easy to Build

Easy to Fly

Ready to Fly $975

ALWAYS WINNERS

Again the Heath Super Parasol won 1st and 2nd places in the Light Plane races at the National Air Races, Cleveland, Ohio, August 27th. Superior design and construction again prove why the HEATH SUPER PARASOL IS America's Most Popular Sport Plane. 21 years of experience built into this plane makes it the safest, soundest and most economical airplane ever built.

Our complete bill of material even to the dope can be had at $199. Get started by purchasing all of the steel tubing and other parts to do the major part of work at less than $40.

All the latest modern steel tube construction. Not a cheap imitation or toy. 10c in stamps or coin brings our large illustrated booklet. Elaborate set of large detailed shop blue prints postpaid $5.00.

HEATH AIRPLANE COMPANY

1721-29 Sedgwick St.
Dept. M-12
Chicago, Illinois

HEATH AIRPLANE CO., M-12, Chicago, Ill.
1727 Sedgwick St., Dept.
Gentlemen: Enclosed find dime or stamps for which send me your large illustrated booklet on the Heath Super Parasol.

Thank You for Mentioning Modern Mechanics and Inventions for December When Writing to Advertisers

Broadcasting Station WISN is operated from The School of Engineering; also Amateur Station W9SG.

Established 1903. Chartered by State of Wisconsin.

"NOW I will train YOU for BIG PAY in ELECTRICITY IN YOUR OWN HOME

Just as I have trained 25,000 Graduates in my Great Electrical School"

Oscar Werwath, E. E.

Director of the Extension Division, School of Engineering — Pioneer in electrical training for 25 years.

NOW, through my Extension Division, I will train you for advancement and MORE PAY in Electricity without your leaving your home! You will get the same course, the same methods, the same faculty of skilled engineers that have made The School of Engineering internationally famous.

Behind your training will be an institution specialising in Electricity. Not a mere correspondence school but a fully established college, over 25 years old, recognized by the U. S. Gov't. Thousands of S. of E. graduates now employed in important positions with largest concerns in the country.

Diesel Engines for the Panama Canal, on which S. of E. Students assisted with acceptance tests at the request of U. S. Government.

Home Shop-Laboratory Without Extra Cost!

A Full-sized Home Shop-Laboratory (not toys) that you can't duplicate for $60, included with each course without extra charge.

Exclusive Patented Laboratory Equipment

that cannot be secured elsewhere. Special Unit Board System makes fascinating sports of laboratory experiments. Amazingly easy to use.

Learn By Doing

No mere book on theoretical study —but PRACTICAL training on full-sized motor, switchboard, circuits, and electrical equipment.

Satisfaction Guaranteed

You can take S. of E. Home Shop-Laboratory training without risking a penny. Guarantee Bond protects you.

ELECTRICALLY TRAINED MEN Earn $3,000 to $10,000 a Year

In Radio, Television, Aviation, Automotives, Refrigeration, Moving Pictures, Super-Power, Lighting—Electricity is the key. Big manufacturers are pleading for men trained in **Practical Electricity.** Salaries of **$3,000 to $10,000** a year now are common. Here is a vast field for you, with unlimited opportunities. **Now** is the time. Start on the road of Electrical Training that leads to bigger pay—bigger opportunities—and SUCCESS!

EARN AS YOU LEARN

Cash in on your Electrical Training while you're learning. Many students report increased earnings, advancement, even while studying. Train in your spare time at home. Employment Service renders FREE aid for life. Lifetime Consultation Service. Many exclusive features available nowhere else. Mail the coupon today for full particulars.

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SCHOOL of ENGINEERING

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FREE!

Send Coupon TODAY for FREE illustrated Catalog — "Practical Electricity—the Key to Success"—and full details of Extension Division Training.

MAIL COUPON NOW!

Extension Division, Dept. 42
SCHOOL OF ENGINEERING
Milwaukee, Wisconsin

Please send me, without obligation, FREE illustrated catalog, "Practical Electricity—the Key to Success," and details of Extension Division training.

Name .....

Address .....

.....

BARGAIN SALE!

SEND NO MONEY. Just fill in Coupon Below. Pay on Delivery. Satisfaction Guaranteed or Money Refunded.

22 CAL. SIX SHOT BLANK AUTOMATIC $4.99

With Box of Cartridges Free

You need no permit or license to own this newly invented high power but absolutely safe and harmless automatic. Positively not a toy. Built like a real automatic, same in construction, appearance, finish, weight and every other detail except that it uses blank cartridges only. Handy for self-defense, frightens tramps, scares away dogs, handy in the house—a real home protector—without the danger of keeping dangerous firearms at home. Play a practical joke on your friends. Ideal at festivals, fairs, picnics, outings, camping, hikes, outdoor sports, etc., etc. Blue steel, case hardened frame. Makes powerful loud report. Has six shot magazine that can be reloaded instantly. Uses 22 cal. blank cartridges. Checkered Grip. Box of cartridges free with each automatic. Convenient pocket size. SEND NO MONEY. Pay on delivery $4.99 plus express charge. Fill in coupon below. NO PERMIT LICENSE REQUIRED. Genuine Leather Holster Free with Each Pistol.

Fifty Shot Target Practice Air Automatic $3.98

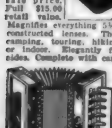
Box of Ammunition Free. Guaranteed to hit a fly at ten feet. The ideal pistol for target practice. Get one today and become a good marksman in short time and at very little expense. Shoots bankshot with accurate precision and great force. Holds fifty shots in magazine. Easy to reload. Excellent for hunting birds, etc. Looks like a real pistol. SEND NO MONEY. Pay on delivery $3.98 plus small express charges. Fill in coupon below.

22 Cal. Repeater Blank 14 Automatic Complete with Box of Cartridges $2.85

No license or permit required to carry this newly patented Blank Automatic. Built like a real firearm, same in appearance, makes a powerful loud report, yet it is absolutely safe and harmless. Use it for protection—to scare away burglars, frighten tramps, drive away dogs, etc., for camping, outing, towns, in city or farm—for play practical jokes on your friends. Uses 22 Cal. Blank cartridges. Can fire two shots simultaneously. Easy and quick to reload. Box of cartridges free with each pistol. Send No Money. Pay on delivery $2.85 plus small shipping charges. Fill in coupon below.

Imported Prism Binoculars $4.69

Buying direct from France we are able to offer you this binocular at low wholesale price. Full $15.00 retail value. Magnifies everything 5½ times. Has well constructed lenses. The ideal glass for camping, touring, hiking, sports, outdoor or indoor. Elegantly finished, adjustable sides. Complete with carrying case. SEND NO MONEY. Pay on delivery $4.69 plus postage. Fill in coupon below.



Genuine Imported Assortment $2.88

No greater value was ever offered in such a high-grade musical instrument. Sweet tone, double action keys, two sets of tone adjusters. Finished in beautiful black. We searched all over Europe to find an accordion that will answer every requirement for a fine instrument. You can obtain this accordion at our ridiculously low price of $2.88, plus shipping charges. Limited stock. Rush your order. Fill in coupon, mail today.

NEW 8 DAY Strap Watch $7.49

LATEST INVENTION

Something entirely new in wrist watches. Runs eight days on one winding. Guaranteed 8 jewel movement. Features the Timekeeper of 8 elements. Perfect timekeeper for those who can afford the best. Handsome chrome finish case. Radium dots in the watch. Nickel silver case. Our 20 years' written guarantee protects you. Send no money. Pay on delivery $7.49 and postage.

Fill in Coupon below.

Pistol Shape Cigarette Case $1.79

Fool your friends with this novelty cigarette case. Looks in every way like a real automatic. Pull trigger and lid flies open, showing a package of your favorite cigarettes. Made of light weight metal in blue steel finish. SEND NO MONEY. Pay on delivery. Fill in coupon below.

MEN'S UP-TO-DATE STRAP WATCH $4.88

Our choice is square, rectangular or tonneau shape at same price. White Gold effect richly carved case guaranteed not to tarnish or discolor, with extra fine Swiss 6 Jewel movement, shock-proof and weather-proof. Tested and adjusted for accurate timekeeping. Regular $15.00 value. Radium dial and hands, tells time in dark. SEND NO MONEY. Pay on delivery. Fill in coupon below.

Beloness Has Created the World's Finest Reproductions of $500 DIAMONDS!

At last! A new process in cutting is discovered. The result—unbelievable sparkle so true that these from $500 Diamonds! Living fire plays over their diamond-cut facets — dazzling, sparkling, scintillating!

Choice of Six Rings $1.98

When shown recently in New York City these Genuine Jenkins Diamonds created a sensation. You, too, will be thrilled at fantasti beauty for the hands!

GIRLS! MEN! Do not confuse Jenkins Gems with ordinary "imitations." Nothing has been found to compare with their lasting beauty. Every stone set in famous DEADVILLE mountings, guaranteed 20 years. Put your faith in a ring that won't disappoint you!

SEND NO MONEY!

Just pay postman $1.98 plus few cents postage when ring you choose arrives. No installments to pay. Order by number. Rings No. 2 and 3 can be had in MEN'S style. To string around finger for size. Buy For GIFTS! Act NOW!

Genuine French Telescope $4.75

No finer telescope was ever made. Full vision powerful lenses. Made of highly polished all metal, leather covered. Section extensions give long distance clear view. This is high class article sold in stores for several times our price. By special arrangement with the factory we are able to give you the benefit of our direct factory price of $4.75. SEND NO MONEY. Fill in coupon. Mail today. Pay on delivery $4.75 and postage.

TEAR OFF THIS COUPON AND MAIL

The Jenkins Corporation, Dept. 13-M-276, 685 Broadway, N. Y.

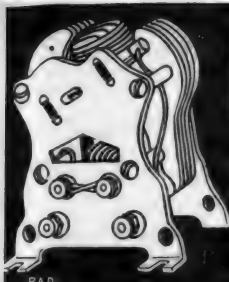
Gentlemen: Kindly ship me C. O. D. the following advertised articles (check articles desired):

..6 Shot Blank Automatic $4.99	..Genuine French Telescope 4.75
..50 Shot Target Air Automatic 3.98	..8 Day Strap Watch..... 7.49
..22 Cal. Repeater Blank Automatic 2.85	..French Binoculars 4.69
..Up-to-Date Men's Strap Watch 4.88	..Imported Accordion 2.88
	..Pistol Shape Cigarette Case 1.79
	..Ring Number 1.98

Name ..... Street .....

City ..... State .....

Thank You for Mentioning Modern Mechanics and Inventions for December When Writing to Advertisers



BOYS

GET THIS ELECTRIC MOTOR ALMOST GIVEN AWAY

R.A.D

A Genuine ERECTOR Motor

Here's a genuine ERECTOR motor. Comes equipped with driving pulley, runs all mechanical toys like Erector, Meccano, etc. Binding posts connect with dry battery or transformer. This is a strongly built little wonder motor, one of the finest we have ever seen. The name Erector is your guarantee of quality. This is just the motor you have been waiting for. With it you can do all kinds of electrical experiments and learn many of the principles of electricity. We are very fortunate to be able to make this wonderful subscription offer this year and we urge every reader of Modern Mechanics to take advantage of this.

We guarantee your satisfaction 100%. Get your motor at once.

32 Page EXPERIMENTS Book FREE

With this very special offer we are giving with every motor a 32-page book of interesting electrical stunts and experiments. This book tells all about motors. Tells you how to take them apart and put them together and teaches you the principles of electricity. Tells how to make a galvanoscope, how to make a magnet from iron nail, how the armature is made, and water heostat. Scores of electrical tricks. Mystifying. The book is full of illustrations and very valuable. Free with this offer.

USE COUPON TODAY!

The Magazine Packed With Thrills!

The Open Road for Boys Magazine has 50 pages every month crammed with thrilling, breath-taking stories that will hold any boy spell-bound. Tense stories of high adventure on land, on sea and in the air. His-man stories, the kind you have looked for everywhere. Deep mystery, suspense, sport, action, thrills. Big "Boy Mechanic Department" every month. Articles on model planes, aviation, sports, etc. Wonderful departments with contests galore and prizes for all. The Open Road for Boys Magazine is one magazine you can't do without. You will be wild about it!

Both Together $1.25

"The Street of Dreadful Silence"

Now starting is a new serial "The Street of Dreadful Silence," the most thrilling, breath-taking mystery serial smash in ten years, a story with a punch in every sentence, a tale that will stand your hair on end. Don't you dare miss it! Start getting your magazine today. The regular subscription price to The Open Road for Boys is $1 a year. Special Offer: For only $1.25 we will send you this wonderful Erector electric motor, a 32-page book of experiments, and a year's subscription to The Open Road for Boys Magazine.

Think of it! All for $1.25. Wow! What a bargain! Hurry!

12 FAT ISSUES

Canadian Postage 25c extra
Foreign Postage 50c extra

Open Road for Boys Magazine,
Department FW-7,
130 Newbury Street,
Boston, Massachusetts.

You bet I'll grab that bargain. Enclosed is $1.25. Rush me the electric motor and the 32-page Experiments Book and put me down for a year's subscription to The Open Road for Boys Magazine. I want to read "The Street of Dreadful Silence."

Name .....

Address .....

City or Town ..... State .....

THIS OFFER MAKES A GREAT XMAS GIFT

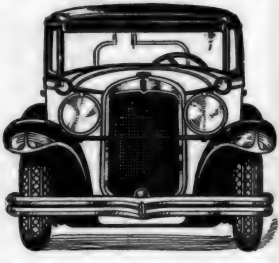
Win A Nash

Sedan

or

$2,750.00

in Cash



Someone who answers this ad will receive, absolutely free, a fully equipped 7-Passenger, advanced Six Nash Sedan, or its full value in cash ($2,000.00). We are also giving away a Dodge Sedan, a Brunswick Phonograph and many other valuable prizes—besides Hundreds of Dollars in Cash. This offer is open to anyone living in the U. S. A. outside of Chicago.

Solve this Puzzle

There are 7 cars in the circle. By drawing 3 straight lines you can put each one in a space by itself. It may mean winning a prize if you send me your answer right away.

$750.00 Given for Promptness

In addition to the many valuable prizes and Hundreds of Dollars in Cash, we are also giving a Special Prize of $750.00 in Cash for Promptness. First prize winner will receive $2,750.00 in cash, or the Nash Sedan and $750.00 in cash. In case of ties duplicate prizes will be awarded each one tying. Solve the puzzle right away and send me your answer together with your name and address plainly written, and I will send you full particulars. $4,500.00 in prizes—EVERYBODY REWARDED.

John T. Adams, Mgr., Dept. 2609
323 S. Peoria St., Chicago, Ill.

Here is my answer to the puzzle.

My Name_____

Address_____

JOHN T. ADAMS, Mgr.

Dept. 2609 323 So. Peoria St. Chicago, Ill.

Fuel Costs Smashed

WONDERFUL INVENTION BURNS OIL NEW WAY

Solves Greatest Problem of the Oil Burner Industry!

Now oil heat is no longer a luxury for the rich. The remarkable invention of a foremost American engineer solves the oil burner industry's greatest problem—to produce a burner every home can easily afford—which SAVES MONEY on the fuel bill—and eliminates dirt, soot and grease!

Fits Any Furnace or Stove

In one minute, the LACO turns your hot-air furnace, hot-water or steam heat plant, parlor stove, or kitchen range, etc., into an up-to-date heating system!

OIL HEAT WITHOUT SMOKE SOOT or GREASE at SAVING in FUEL COST

The new way of burning oil—patented and found only on the Laco Oil Burner, results in tremendous economies. Other power burners, by means of air pressure, convert the liquid oil into a spray and burn oil in spray form. The surplus air pressure thus required blows a large part of the spray upward, out of the smokestack, wasting heat, increasing fuel expense. Contrast this with the LACO, which by means of the indestructible MINERAL WICK, converts the oil into hydro-carbon GAS, the most perfect medium for creating heat known to man—because ALL of it burns and WASTE IS ELIMINATED!

Fully Automatic

Thermostat control—as much heat as you want, WHEN you want it. Operates quietly. Nothing to adjust. Designed to last a lifetime. Guaranteed. Complies with all ordinances. Actually SAFER than the ordinary kitchen gas range!

Sold on Easy Terms

Our EASY PAYMENT PLAN enables you to enjoy oil heat *this very year!* Now, resolve to end your slavery to King Coal—carrying dirty, heavy coal and ashes, chopping, shoveling, smoke, odor. No more getting up early on cold mornings to start stubborn fires—install a LACO and forget about your furnace!

New Convenience—New Cleanliness

The spray form method of burning oil means waste oil and that means smoke, soot, grease. The LACO does away with all this! The LACO by burning ALL of the oil in GAS form eliminates waste, thus providing CLEAN HEAT, free from dirt or grease.

Mail Coupon for Introductory Low Price Offer!

Tell type *bf* heating system you now have. Get our easy terms and special low price offer. Mail the convenient coupon NOW!

MAIL FOR INFORMATION & SPECIAL LOW PRICE OFFER

LACO OIL BURNER CO.
2004 Union St.
Griswold, Iowa

Send facts about your burner, the New Mineral Wick, and Special Low-Price Offer.

Name.....
St. or Rt.....
Town..... State.....
Kind of heating system I now have.....

DEALERS WANTED

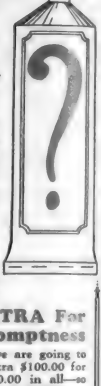
We want rated men—preferably—but also the man who will invest a small amount in demonstrators—then get out and SELL. If this description fits you, we will offer you an opportunity *big enough for any man!*

LACO OIL BURNER CO.
2004 Union St., Griswold, Iowa

WIN $1000.00 CASH

NAME THIS

This Offer Open to Every Reader of this Announcement



Have you sent a name? If not, do so at once. It makes no difference who you are or where you live, we want you to send us a name for this new and unusual shampoo. Whoever sends the most suitable name will win the one thousand dollars—nothing else to do. Just write or print the name on any kind of paper—neatness doesn't count.

Nothing to Buy--Nothing to Sell

You can use a coined word or a word made by combining two or more words, such as "Sungleam," "Youthglow," etc., or any other name you think would fit the high quality of this shampoo. Or your name might suggest the handy new container, our latest sanitary tube from which the Shampoo is simply squeezed out, thus eliminating the waste and trouble caused by the old-fashioned liquid soap in bottles. There is nothing to buy or sell—simply the person sending the most suitable suggestion for a name will receive $1,000.00 cash prize, or if prompt $1,100.00 in all.

ANY NAME MAY WIN

No matter how simple you think your suggestion is you cannot afford to neglect sending it at once. Any name may win. Win this $1000 cash prize by a few moments' thought. How can you earn this amount of money easier or more quickly? Remember, there is no obligation! The person submitting the winning name will have nothing else to do to win the $1000 and the extra $100, if prompt. In choosing a name bear in mind this shampoo is marvelous for cleansing the hair and scalp. It is designed to bring out the beauty, lustre and natural gloss of the hair. Remember, too, how handy the new sanitary tube is for traveling, no bottle to leak or spill, no cake of soap to lie around and collect germs. The only thing necessary to win is to send the name we choose as the best and most suitable for this shampoo. Only one name will be accepted from each contestant. This unusual offer is only one of a number of offers embraced in our novel distribution plan of ultra toilet goods, whereby those taking part may win any one of a hundred other prizes, the highest of which is $8,000 cash. By participating in our distribution plan the winner of the $1,100.00 cash prize may win an additional $8,000.00, making a total of $9,100.00. Everyone sending a name, regardless of whether it wins or not, will be given the same opportunity to win the $8,000.00 or one of the other one hundred cash prizes. Get busy with your suggestion at once—do not delay!

$100 EXTRA For Promptness

To get quick action we are going to pay the winner an extra $100.00 for promptness, or $1,100.00 in all—so send your suggestion AT ONCE!

CONTEST RULES

This contest is open to everyone except members of this firm, its employees and relatives. Each contestant may send only one name. Sending two or more names will cause all names submitted by that person to be thrown out.

Contest closes April 30, 1930. Duplicate prizes will be given in case of ties.

To win the promptness prize of $100 extra, the winning name suggested must be mailed within three days after our announcement is read.

PARIS AMERICAN PHARMACAL CO.,
904 McCune Bldg., Des Moines, Iowa.

Enclosed with this coupon on separate sheet is my suggestion for a name.

Date this announcement was read.....

Date my suggestion is mailed .....

Name .....

Address .....

NOTE: Being prompt qualifies you for the extra $100.00 as outlined in this announcement.

Thank You for Mentioning Modern Mechanics and Inventions for December When Writing to Advertisers

This Singular Book Wields a Strange Power Over Its Readers

—showing them how to magnetize their personality *almost at once!*

Will You Read It 5 Days FREE—to Prove It Can Help Multiply *Your* Present Income?

A STRANGE book! A book that almost seems to cast a spell over every person who turns its pages!

A copy of this book was left lying on a hotel table for a few weeks. To quote the author, "Nearly 400 people saw it—read a few pages—and then *sent for a copy!*"

In another case, the author reported that a physician placed a copy in his waiting room where more than 200 patients saw the book—read part of it—and then *ordered copies for themselves!*

Why are men and women so profoundly affected by this book?—so anxious to get a copy? The answer is simple. The book reveals to them how any man or woman—young or old—can develop a Magnetic Personality! It explains how to develop the personal charm that attracts friends—the self-confidence that helps insure success in any business or profession.

It tells how to draw people to you—how to be popular—how to overcome timidity and self-consciousness—how to be well-liked wherever you go.

Best of all it tells you how to accomplish these results quickly and easily!

Whence Comes This Uncanny Volume

Forty years ago, Edmund Shaftesbury, famous student of the human mind, set out to discover the secret of Personal Magnetism. He applied his discoveries to his friends. Results were astonishing! His methods seemed to transform people into *entirely new* beings!

Shaftesbury's fame spread. Great men came to him. Among his students and friends were Gladstone, Queen Victoria, Edwin Booth, Henry Ward Beecher, and Cardinal Gibbons.

Until recently, Shaftesbury's teachings have been available only to people who could pay $25 to $50 each for instruction books. Now, some of his most important teachings have been collected in a single volume, at a price *within the reach of all!* Furthermore, in this volume are revealed hundreds of Shaftesbury's discoveries never before put into print.

Strange Effect on Readers

Readers of this book quickly learn the secret of attracting others—of influencing the men and women around them. Not by force—not by loud argument—but rather by applying certain simple, scientific rules that enable them to play on people's feelings just as a skilled violinist plays upon a violin.

Is it any wonder that thousands of men and women say they are overjoyed with the results they have received? One enthusiast said of this volume, "Things I have read there I would never have dreamed of."

BOOK TELLS YOU

How to develop a magnetic personality.
How to gain nerve control.
How to read people's feelings by watching their mouths.
How to end awkwardness and timidity.
How to utilize your subconscious mind.
How to get ahead in your business or profession—and dozens of other vital topics.

Another wrote, "I would not give up what Shaftesbury has taught me for $100,000!"

In your everyday life—in social life and especially in business, you will find this book of immense value. It will help you to attract new friends and to gain the promotion and increased income which seem to come so easily to men and women who have developed MAGNETIC PERSONALITY!

Read This Book 5 Days FREE

Merely mail coupon below and this remarkable volume, with cover in handsome dark burgandy cloth, gold embossed, will be sent you for free examination. If you aren't stirred and inspired in the 5 day free period, return and pay us nothing. Otherwise keep it as your own and remit the special price of only $3 in *full payment.*

You are the sole judge. You do not pay unless you are absolutely delighted. And then only $3. Don't delay! Clip and mail the coupon NOW. Ralston University Press, Dept. 212-W, Meriden, Conn.

RALSTON UNIVERSITY PRESS, Dept. 212-W, Meriden, Conn.

All right—I'll be the judge. You may send me the volume "Instantaneous Personal Magnetism" for 5 days FREE EXAMINATION in my home. Within the 5 days, I will either remit the special low price of only $3 or return the book without cost or obligation.

Name .....

Address .....

City ..... State .....

Special cash price $2.00 if payment accompanies coupon. This saves heavy bookkeeping and clerical expense. Money refunded if dissatisfied and book is returned within five days.

From Spare Time Work To a Fine Paying Cash Business Of Your Own

"As far as saw filing is concerned, I've plenty of it from all around. I continue to keep my old customers and am adding others continually. Now sole proprietor."
T. F. WILSON.

"I ordered a Foley which I intended to use on my own saws, being a carpenter, and also do some filing on the side, but soon found I would have to quit one or the other, so started filing. I have built up a nice business that is better than carpentering."
R. C. MOLLER.

"People are coming from all directions to have their saws filed and my Foley Filer and I am glad to say this angle is in my favor."
L. C. CHRISTENSEN.

Make $2 to $4 An Hour In Spare Time While Starting

Our free plan will help you start and show you how to develop a **permanent, fine paying business** filing saws on the Foley Automatic Saw Filer, that will give you a **cash income the year 'round.** Hundreds of men have taken advantage of this wonderful offer and are now on the road to success and independence! They are making big money, and so can you.

No Canvassing

No house to house canvassing. You can start this fine paying business in your basement, attic, garage or almost any place. The Foley Automatic Saw Filer does such superior work that carpenters, contractors, farmers, factories and many others will give you all the work you can handle. No stock to carry —very little capital required.

No Experience Necessary

It is easy to learn to file saws on the Foley. Adjustments are few and simple. All you have to do is adjust the saw in the machine and turn on the power—it files automatically. Does a better job than the most expert hand filer, and quicker, too. J. J. Southwick writes, "Enclosed contract for my second Foley Filer. The first machine easily paid its own way and increased business. In July (the dullest month of the year) I filed 220 saws, I am going to pile up about 300 this month, (August) another dull month."

FOLEY MANUFACTURING CO.
1261 Foley Blds.,
11 Main St. N. E.,
Minneapolis, Minn.

Please send me your **Free Plan** telling me how I can start my own business and make **Big Money** with the Foley Filer.

Send Coupon for Free Plan →

Don't **delay**—get started now. You can make extra **money** while you are starting, and you'll be surprised how soon you will have your own fine paying business, and all the work you can do. Send the coupon for **free plan** NOW!

Name.....

Address.....

City..... State.....

Thank You for Mentioning Modern Mechanics and Inventions for December When Writing to Advertisers

Don't Say You Never Had a Chance to Get an Education!

Here's Your Chance!

The Quickest, Surest, Easiest Way...

Don't hobble along through life taking the short end of things and letting other men get the good jobs, the comforts and pleasures of life, away from you just because they have the advantage of education! You can have as good an education as they—quickly and easily—and you don't have to go to high school or college for it! More money, power, popularity are at your command just as soon as you give yourself the education that wins them. *And here's the quickest, easiest way—*

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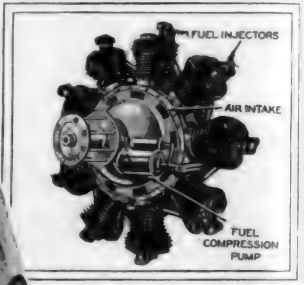
HENRY FORD

Those who assume that we have reached the true industrial age are doubtless in line for a big surprise, says Henry Ford in this remarkable interview in which he declares the real industrial age is just dawning, and advances valuable information on needed inventions of today and tomorrow, such as a revolutionary airplane engine; a powerful motor fuel; and a method of converting coal to power underground.

Henry Ford considers the pressing need for new inventive genius for "the real industrial age which we are yet to enter."



Ford predicts a new type of airplane engine using a new condensed fuel of greater power. Here is an artist's conception of such an engine with no carburetor and no ignition system; the fuel to be injected directly and ignited by the heat of compression. The fuel may be in some variety of highly condensed hydrogen in liquid form. It will be injected into the motor in semi-solid form.

INVENTIONS! Discoveries! The past fifty years has been an age of marvels, with amazing discoveries in every field and new applications of old principles on every hand. Much has been accomplished—more than has been accomplished still remains to be done! The world's work must be done, and machinery must inevitably be keyed up to higher speeds to accomplish it.

Among scores of famous scientists and inventors with whom I have come in contact in the great research laboratories of the nation, such as the General Electric, Westinghouse and the Bureau of Standards there is not one but believes that the next fifty years as an epoch of invention *will exceed the past fifty*. Thousands of new machines will be patented by tomorrow's inventors.

What will these inventions be? What are our greatest needs today? Recently, in Dearborn, Michigan, I had an opportunity to put questions of this sort to Henry Ford. The answers he gave me are stimulating and informative to a high degree. To begin with, let me explain the *point of view* from which Mr. Ford discusses what is to come.

TELLS WHAT to INVENT

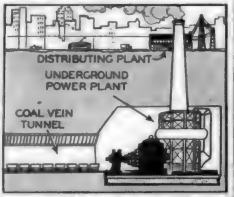
In an Interview by **M. K. WISEHART** *Author of "Marvels of Science"*

"We already live in a *comfortable* age," he said, "but it is *not* as comfortable as it is going to be. We have made a beginning. Many things remain to be done.

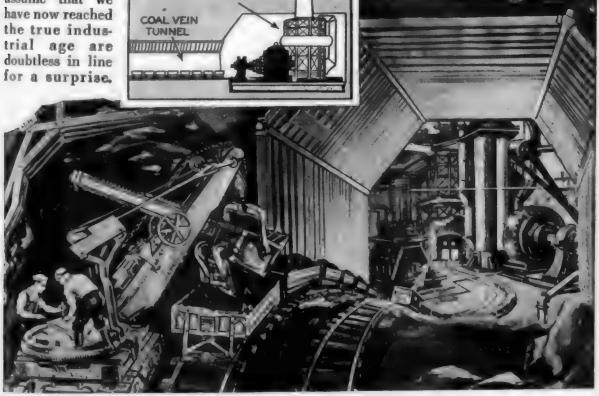
"It is sometimes said in criticism that ours is a machine age. It certainly is. But those who imply that men have been made machines and that life has been mechanized, are reactionary in their thinking. The machine appears only through man's mastery of it. It has been invented and adopted and used by men, first, to save the dignity of their homes by centralizing work in factories, and second, to save time.

"Those who assume that we have now reached the true industrial age are doubtless in line for a surprise.

"What we have to show as yet for the hundreds of generations of labor that have preceded us, is far too little. The *real* industrial age which we are yet to enter will be less noisy, more beautiful, more just,



Factories receive electric power generated in underground coal mine.



"Why not convert coal into electric power by burning it underground?" Henry Ford asks. Above is an artist's conception of an underground conversion plant on a level with the coal veins.

Ford Says Chance to Invent Confronts Everyone Holding a Hard Job

more conducive to higher levels of living for all, than is the present stage."

"Just what inventions would you say we are most in need of today to further this ideal industrial age?" I asked.

Let me say at once that Mr. Ford did not answer this question directly. Rather, he pointed out the needs of today and tomorrow by discussing the *opportunities* for inventiveness which confront our generation, our geniuses and all who are of an inventive turn of mind; and he spoke as though much might be expected from the *young* mind, the unconventional mind.

"If the young man of today wants to tie up with something that has a great future, he will go digging a f t e r the airplane," said Mr. Ford. "He will need lots of help. The *first* thing he ought to do is to find out what has been done to bring the airplane to its present phase. The fact is that today there is no such thing in existence as an airplane engine."

"Just w h a t do y o u mean by that?" I asked.

"Boys who are thinking about airplanes now do so without even knowing what kind of engine the a i r p l a n e ought to have. It reminds me of the time when I was starting in. I was then thinking in terms of steam because steam was in use in locomotives. It was only after much experimenting that I turned to the gas engine. It's perfectly natural that boys should think that airplanes must be run with gas engines. They think so because automobiles are run by gas engines. But some day a boy will come along who will discover that gas engines are not the thing at all.

"What we now *call* airplane engines are really automobile engines in all their fundamental principles. Some of our experiments here at Dearborn may help discover what an airplane engine should be like. At present, we are giving our attention to the Diesel engine. The outlook is fairly promising.

"No one knows now just what the airplane engine of the future will be like, but you can be pretty sure it will have four characteristics: first, slow speed; second, reliability; third, perfect balance; fourth, it will use a fuel that will be four or five times more powerful than our present fuel. By the time the engine that will meet these requirements is ready, we may have a type of plane that can come down and make a landing at a speed considerably less than sixty miles an hour."

HENRY FORD

Tells you to devise some method of converting coal to electric power by burning it under ground so power can be sent by wire instead of freight, and he advises you to invent: a new airplane engine of slow speed, great reliability, perfect balance and burning cheap fuel five times more powerful than gasoline; a cheaper, more powerful engine fuel; better house insulation for electrically heated homes; a kitchen to feed a hundred people; new highway surfaces; and cities adapted to modern traffic.

When Mr. Ford speaks of the fuel of the future he thinks of something with "gip" in it — and four or five times the "gip" that is in our present day fuel. What will this fuel be? Whence will it come? He foresees no shortage of fuel for our internal combustion engines in the future.

"We can get fuel from fruit," he says, "f r o m that sumach by the roadside or from a p p l e s, weeds, sawdust — almost anything! There is fuel in every bit of vegetable matter that can be fermented. There is enough a l c o h o l in one year's yield of an acre of potatoes to drive the machinery necessary to cultivate the field for a hundred years."

And it remains for some one to find how this fuel can be produced commercially — better fuel at a cheaper price than that we now know!

"In all probability," said Mr. Ford, "American cities will in the future be heated by electricity. This means that our houses must be built different—better! We must find out how they can best be insulated.

Then they will be cooler in summer and more evenly heated in winter.

"Why not convert coal into electric power by burning it underground and sending it to the city from the mine without ever bringing it to the surface? That's what they'll do in the future. When the time comes, ways will be found to dam up the necessary water for condensing the steam. We have a 'lake' on the roof of one of my Michigan factories now for just that purpose. I am beginning to send power by wire instead of by freight load!"

Mr. Ford says that a big opportunity for inventing something that meets the needs of the time confronts every man who has a job that is too hard for him. "If I had a job that seemed too hard for me," he said, "I would set to work to find out how to make it easy. A serious attempt to take the drudgery out of a job will start a man to creating something. He may build his future around a discovery of which the world stands in need."

"Remember," he cautioned, "that individually men invent but little. We accomplish most by combining in new ways, principles and devices previously discovered. What has already been done is not necessarily the best that *can* be done. From where we are, we are going ahead. Many changes are just around the corner. Think of the waste in time, money and effort involved in cooking in thousands of different homes in a single community! Let a young man turn his attention to inventing a kind of kitchen that can feed a hundred people! The day is coming when cooking will no longer be done for individual families. What kind of a kitchen it will be that will take this drudgery out of the home, and how the work should be done, remains for somebody to find out. In years to come we shall undoubtedly use rubber for floors and thousands of other purposes for which we do not even consider it today. In Switzerland, it is now being used for roads. In America, we have progressed from dirt, wood, stone, tar, and macadam to cement roads. Will the roads of the future be built of rubber? That question is worth thinking about.

"We need a much greater rubber supply. In due time, from various sources, we are going to get it. Mr. Edison, after long experiment has found an herb that produces the most rubber. Not a bush nor a tree, it is an herb that grows everywhere. Mr. Edison says that the rubber produced from crops of this herb will furnish an emergency rubber supply in case our imports are ever cut off. Whether it will do more than that he will eventually tell us."

THOMAS EDISON

The electrical wizard tells you that the time has come when we are ready for the full automatic machine, which is in use only to a limited extent. He sees a need for garment manufacturing without any handwork, suggesting that a machine be designed to take in cloth at one end and drop out the finished coat or trousers at the other. He advocates the creation of a government school to train men capable of applying knowledge of the possibilities of fully automatic machinery.

Here Mr. Ford told me a story with a moral. As you will see, the moral has to do with the *method* of the inventor. If you were starting out today to invent something, what is the first thing you should do? I quote Mr. Ford in answer:

"Back in 1884, I was agent for the Westinghouse company, and did repairs for them. I was asked to fix something on a portable steam engine. It was a Mills engine—built by Emory W. Mills, a master mechanic of the 19th century. I ran it all that day, and never had occasion to operate another like it until a short time ago.

"Recently, at Malone, New York, when we were searching the country over for old engines that will help boys visualize America's mechanical progress, we came across one of those built by Mills. We acquired the parts and the engine is now as good as

ever. I doubt if there is another in the country. Very few of them were made before the death of Mills put a stop to production.

"Mills was a genius fifty years ahead of his time. He put into that old machine many of the things that are found in the most advanced steam engines of today. He had the superheater idea a quarter of a century before it was applied to locomotives. No other steam portable engine has ever equalled it for efficiency.

"Of course, the demand for such an engine has been outgrown today, by reason of the use of other motive power for portable engines. If, however, a man, for some reason, had occasion to develop a portable steam engine for use today, his job would be greatly facilitated, and his *imagination stimulated*, if he first found out how Mills handled the problem.

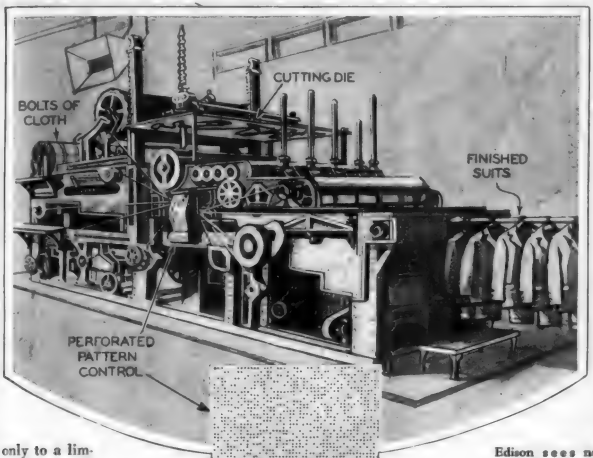
"When a man sets out to do any kind of job that is new to him—to write a thesis, to improve some industrial process, to design or invent a machine, the first thing he wants to do is to *find out what has been done*. He ought to discover all he can about what has already been accomplished by others who have worked on the same problem. If he doesn't know what has been done *before*, he is almost certain to go *back*."

I can remember when, early in my experience as a newspaper reporter, Thomas A. Edison talked with me about inventions and needs of the day much as Mr. Ford did recently. In one respect these two men take an identical attitude when discussing this subject. Both refuse to be didactic and to name the *one* thing of which the world is *most* in need. The simple truth of the matter is that there are too many needs today for any one to be said to over-top all the rest.

And yet, my impression is that with regard to what this one greatest need is both having something in particular in mind—and that has to do with the development of full automatic machines. Hear what Mr. Edison has to say on this subject.

"Machines of a semi-automatic character have given us most of the great conveniences of our new industrial age, including the eight-hour day. The time has come when we are ready for the full automatic machine, which is in use

The accuracy of Henry Ford's perception of future mechanical needs has been proven by the wide acceptance of his first cars and the new car shown above with Mr. Ford and his son, Edsel.



Edison sees no need for handwork in garment manufacture, believing the fully automatic machine can do the work. Here is an artist's conception of such a machine taking cloth in at one end, cutting it and making complete suits delivered at the other end, the process controlled by the famous Jacquard loom principle.

only to a limited extent."

Mr. Edison sees no reason why any handwork should be necessary in the manufacture of a garment. Why should not a machine be designed to take in cloth at one end and drop out the finished coat or trousers at the other?

And he speaks of the principle of the Jacquard loom, a great mechanical principle as yet limited in application mainly to the manufacture of silk and to the player piano. This he calls the great "reserve" principle of the future —"the principle which brings into action the various parts of a machine in accordance with a perforated pattern traced on a steel card or as on the paper roll of a player piano." As a means of control this principle can be applied to any machine.

"The full-automatic machines now in use give us an indication of some of the savings that we may expect," says Mr. Edison. "Full-automatic machines are now making screws and all kinds of small parts. These machines require very little attention, if any at all, one man being sufficient to attend a dozen of them. Hence, the costs of screws and small parts are very low.

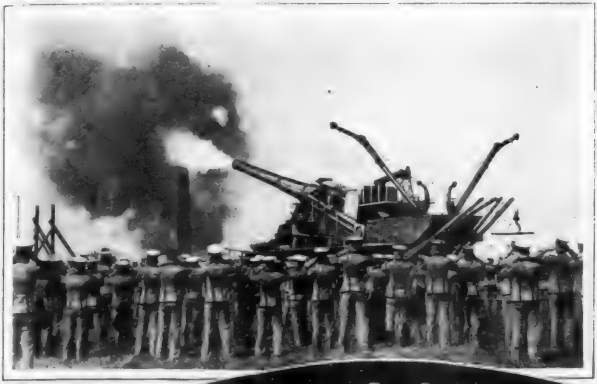
"We have the Naval Academy and the Military Academy to develop sailors and soldiers. Why should we not have a government school of automatic-machine designers? Our delay in adopting full-automatic machinery is due to a lack of men who can design it."

Here is an illustration of a perforated pattern strip which could control machinery as similar strips control player pianos and the monotype machine.

Deadly WEAPONS

This composite photo shows the latest types of anti-aircraft instruments in action against enemy aircraft. The large horn-like contrivances in the left foreground are direction finders which collect sound waves from airplane motors and enable plane positions to be computed. They are used particularly at night. The gun is a 3-inch weapon capable of firing 25 shells a minute. The two soldiers in the foreground are using an instrument which gives them the range of the planes. A similar mechanism, known as the anti-aircraft director, computes an airplane's position instantly and allows automatically for wind speed and other factors affecting the plane's position.

of the NEXT WAR



Firing a 14-inch gun.

Destructive as were the weapons of the great war, nations of the world have increased their deadliness, as described in this article by Mr. Miller, so that the next battle of the nations will surpass all others in destructiveness.

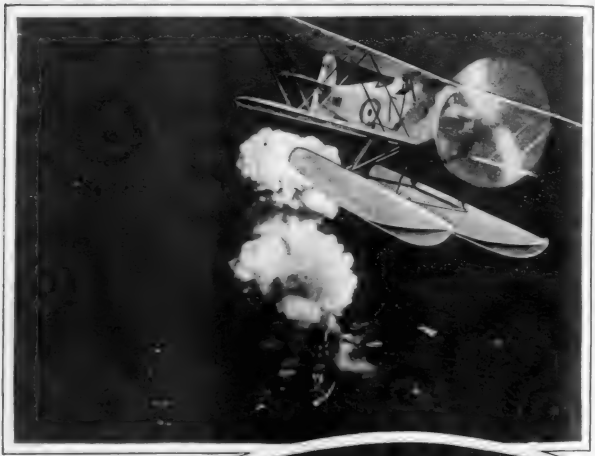
This Christie tank attained a speed of 76 m.p.h. before it plunged into an artificial mudhole, which it negotiated without difficulty.

By JAMES NEVIN MILLER

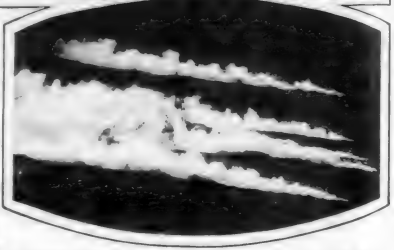
ANTI-AIRCRAFT guns capable of firing 25 3-inch shells a minute, bringing down bombers miles in the heavens; range-finding mechanisms which determine an airplane's position so accurately that they in effect make anti-aircraft guns self-aiming; amazing armored tanks which travel 70 miles an hour—these are only a few of the astonishing new war machines developed by army experts ready for deadly service in the next war.

Perhaps most marvelous of all these deadly machines is the anti-aircraft director, which is described by Capt. G. M. Wells, chief of the anti-aircraft section of the army artillery, as "a super-computing machine which automatically observes the target and computes its future position in space. Wind, temperature, and other factors which influence the flight of the plane are automatically corrected within the instrument itself."

Battleships Employ Smoke Screen as Defense Against Airplane Attacks



A single 2000-pound bomb is sufficient to sink a battleship. The photo shows a demonstration bombing by the Navy. The white smoke is rising from a direct hit scored by the plane.



America's system of laying smoke screens to protect battleships against air attacks is considered to be the world's best developed.

Detection of airplanes from the ground at night is simplified by special apparatus. Giant searchlights capable of spotting planes 8 miles away have been devised. Two large horns, mounted parallel to each other, collect sound waves from an enemy plane which enable an operator to determine approximate position. With the aid of another instrument called the acoustic corrector, the time required for the sound to travel from the plane to the horns is computed and the true position of the plane is found. These marvelously efficient anti-aircraft instruments, as well as the guns themselves, are mounted on rubber-tired trailers and can be transported swiftly as the need may arise.

Remarkable as are these anti-aircraft weapons, they are no more startling than the amazing new combat tanks recently tested by our government. This machine is known as the Christie light tank. It is a three-man affair which can travel at 70 miles an hour over smooth roads and 43 miles an hour over rough, plowed fields. It can operate with or without the familiar caterpillar treads, which can be removed in

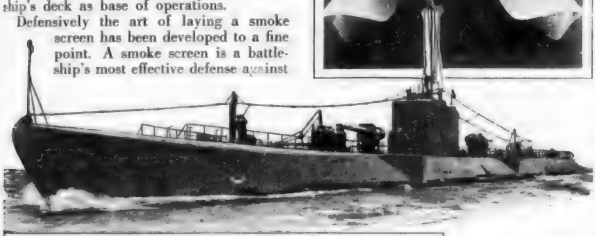
Tiny Folding Wing Scout Plane Built for Carrying in the Hull of a Sub

14 minutes for cross-country travel.

Another type of light tank, more extensively developed since the war than the new Christie model, is adapted to carry a 75 mm. gun with armored shield, cargo body for ammunition, spare parts and anti-aircraft gun mounts. Another type of vehicle now under development will be used to carry forward machine gun squads after the larger machines have overcome enemy resistance.

Naval armament has kept pace with land weapons, both as regards offense and defense. The U. S. Navy now has three huge airplane carriers which house a swarm of warplanes ranging in size from large bombers to tiny scouts. These planes take off from the deck of the mother ship, complete their missions, and return. Some of them have pontoons and can land in the sea; most of them are land planes which use the ship's deck as base of operations.

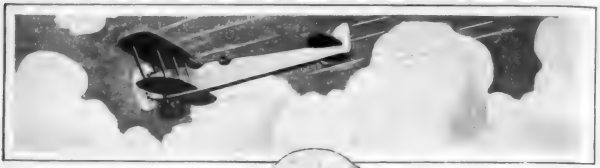
Defensively the art of laying a smoke screen has been developed to a fine point. A smoke screen is a battleship's most effective defense against



This drawing shows the method of launching a scout plane from a submarine. The watertight compartment in which the plane is carried is opened, the tiny craft moved out upon the hull, and the folding wings opened. With the motor started and the pontoons in the water, the take-off is not at all difficult.

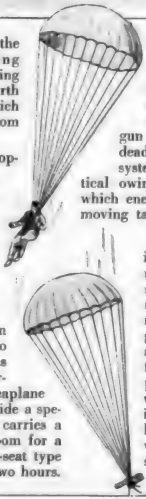
Last word in naval air armament is the tiny folding wing seaplane shown above, which is intended to be carried in the hull of a submarine to be launched for scouting purposes when desired. The plane is the Parnall Peto, of English design. It carries two men and fuel enough for a two-hour flight. The submarine V4 is the latest type of American submersible, capable of carrying planes of the type shown. The V4 cost $5,000,000 to build, is 381 feet long, and is equipped to lay mines in harbor mouths to block the enemy's maneuvers.

Machine Gunners Dropped from Planes Attack Enemy Behind Lines



air attack, excluding, of course, the activities of her own defending planes. Swift destroyers, running ahead of the battleships, belch forth obscuring clouds of smoke which effectively hide the big ships from enemy airmen.

One of the most recent developments in naval armament is the tiny folding-wing airplane to be carried in the hull of a submarine. England is the pioneer in this field, and she has closely guarded her secret. At the recent London air show a number of these small planes, along with a bomber credited with a speed of 200 miles an hour, were ordered withdrawn from exhibition by the government as being far too secret for public display. It is known, however, that the submarine plane is a Parnall Peto, a seaplane which folds its wings and slips inside a special compartment of the sub. It carries a pilot, an observer, and there is room for a wireless set, chart case, and a two-seat type chute. The plane has a range of two hours.



Although not strictly a new weapon of warfare, the Army has been experimenting with parachutes capable of dropping machine guns from airplanes, the purpose being to set up machine gun nests behind enemy lines in the dead of night. For daylight use the system has not yet proved itself practical owing to the comparative ease with which enemy snipers can pick off the slow moving targets.

In the field of big guns, the 14-inch "Big Berthas" of American make which demonstrated their superiority in the world war still represent the latest word in armament. A photo of one of these guns, mounted on a railway car, appears on page 51. These guns fire a projectile weighing 1400 pounds a distance of 25 miles with astonishing accuracy. During the war they were used in batteries of five, and when they went into action the enemy sought shelter holes in a hurry. These guns are also used in battleships.

American army officers were first to experiment with dropping machine guns and gunners from airplanes via parachute. The photo shows gunners setting up their weapons within two minutes after they left their plane 1500 feet above.

Headphones Enable Deaf to Enjoy New Talking Pictures

A Brooklyn theater has installed headphones equipped with sound regulators in one section of the house for use of deaf patrons.

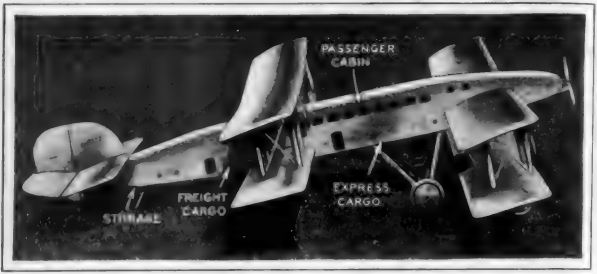
Members of a hard of hearing society testing theater headphones.

COMPLAINTS from deaf persons that the advent of talking movies has ended their amusement in the silent drama has been met at the Brooklyn Paramount Theatre with specially designed acoustic equipment which will enable most of them to hear clearly the speaking and sound effects of the new type of moving pictures. Headphones have been wired to thirty seats on the mezzanine floor which have been attached to the sound reproducing equipment in the operator's booth. The Western Electric Company, which supervised the installation, stated that this experiment is the first of its kind, since the inception of the talking picture. The headphones are of the usual type. In the hand of the user will be a special potentiometer or regulator shaped like a fountain pen by means of which the volume of sound can be controlled according to individual requirements. The apparatus was exhibited at the tenth annual meeting of the American Federation for the Hard of Hearing in Cleveland, where 57 per cent of the 300 delegates reported that the use of the headphones resulted in perfect hearing. More than 29 per cent reported "fair", while the remaining 14 per cent were by their own statements deaf beyond hope of improvement, and even 7.5 per cent of these were able to report "poor" hearing.

World's Smallest Fire Engine

THIS compact affair, the smallest fire engine in the world, is used throughout England to fight small fires in outlying districts, too far from large fire companies.

Navy Flyer Invents Tandem Airplane for Heavy Loads



This tandem airplane is 130 feet long and has 96-foot wingspread to lift more than 85,000 pounds.

Sails For Bicycles Save Legs

SAILING on bicycles is one of the newest sports developed abroad, thanks to the inventive genius of Hans Botstieber of Lucerne, Switzerland, shown below on his sailing bike. The mast is firmly bolted to the frame of the vehicle and the cord mainsheet held to the left handlebar grip.

Mast bolted to bike frame as shown supports sail.

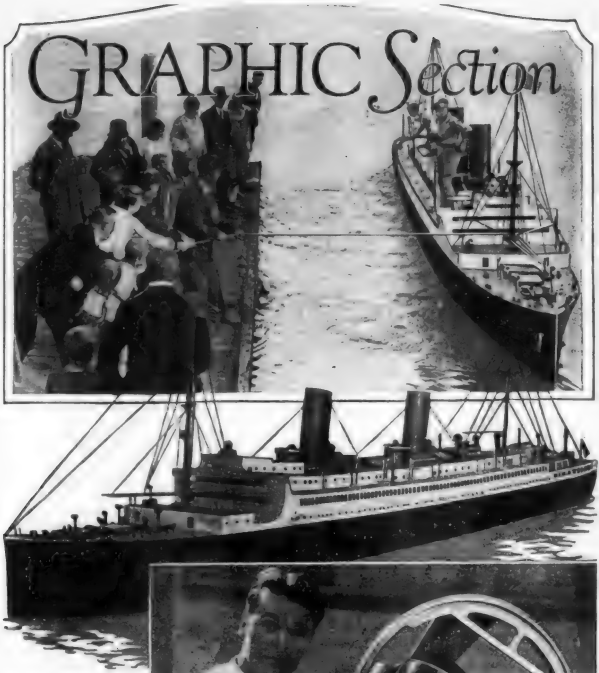
A TANDEM airplane called the *Karr-Avan* has been invented by Harold H. Karr, a naval aviation pilot at North Island, San Diego, California. The ship which is 130 feet long and has a wing spread of 96 feet is able to lift 85,000 pounds. The unique flying machine will be powered by five 420 h.p. engines and will have a top speed of 135 miles an hour. The ship will carry 80 passengers and their baggage more than 4,000 miles without a halt.

Aluminum Dust Makes Hot Flame

A FLAME so intense as to melt its way through any known solid substance is produced by a new type of blowpipe, employing finely powdered aluminum instead of the more familiar hydrogen or acetylene gases. The new invention was described by Dr. Frank M. Strong of Syracuse University, as follows:

"A screw conveyer carries a slow stream of aluminum dust from the bottom of a hopper out through the open end of a brass pipe. The dust is here met by a swift cross-stream of oxygen, with which it forms a fine and uniform suspension. From this point the mixture is passed forward through a larger tube, which a little farther along is divided up into eight smaller tubes. The latter diverge from the central tube for a short distance, and are then curved back inward so as to come to a sharp focus. The aluminum-oxygen flame can be lighted at this focus point with a match or Bunsen burner."

GRAPHIC Section

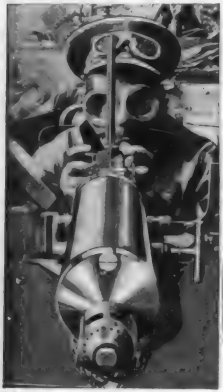


All the characteristics of a mammoth ocean liner are reproduced in the "Columbus," the miniature ship shown above. It is 25 feet long and was constructed by a German engineer at a cost of $4000. Top photo shows the model coming into dock under its own power after a practice spin; below it appears a close-up of the ship. It is driven by an electric motor.

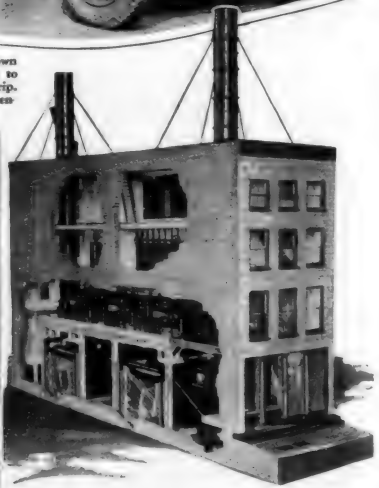
Neil Hamilton, movie actor, demonstrates a revolving camera for taking "dizzy" shots in which rooms and people tumble all over the screen.

Novel Automobile Is Driven By a Single Wheel at Rear

Half automobile and half motorcycle, the novel vehicle shown above was built by an Englishman to take his bride on a honeymoon trip. The car is driven by a motorcycle engine and rear wheel.

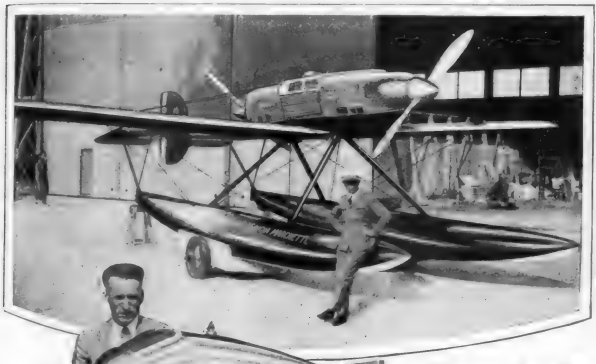


British machine gunner with gas mask and latest type rapid fire gun.



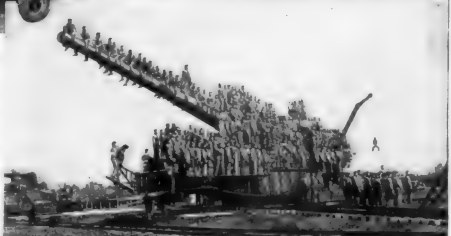
The above model of the first commercial electric generating station, designed by Thomas A. Edison in 1882, was made for Henry Ford's museum at Dearborn.

Tandem Motors, Long Floats, Mark Unique Air Racer



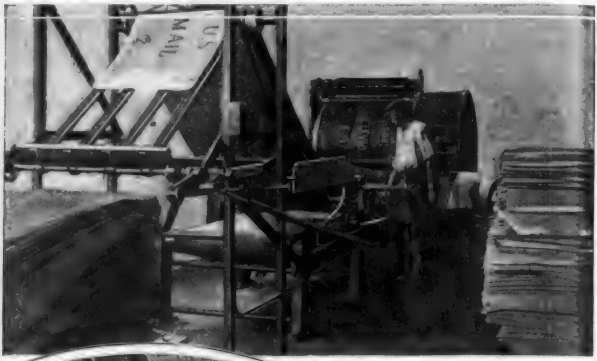
This shows a Savoia Marchetti twin-motored seaplane with its pilot, Dal Molin, standing alongside. This is Italy's fastest airplane, capable of a speed of 200 m.p.h. Note position of pilot's cockpit between the two motors.

Static lift of dirigible gases combined with dynamic lift of airplane wings is expected to make the novel aircraft shown above the air leviathan of the future. Its inventor, John Hodgdon of Long Beach, Cal., claims that the presence of wings will prevent the rolling and pitching common to blimps and will make it possible for his ship to land without the aid of a ground crew.

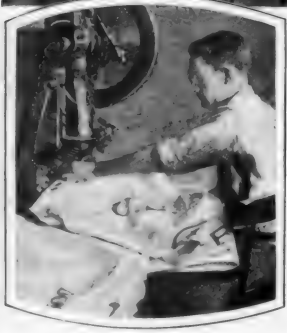


One of the largest guns in Uncle Sam's army was inspected by West Point cadets of the graduating class who visited the Aberdeen proving grounds near Washington. The Big Bertha shown in the above photo is a 14-inch mounted railway gun which fires a projectile weighing 2000 pounds a distance of 32 miles, and can pierce 14-inch armor plate.

Uncle Sam Manufactures 2,000,000 Mail Bags Each Year



This special machine cuts, prints, folds and stacks the mail sacks in one operation.



The machine shown above rivets the grommets, or metal eyelets, into the mail sacks. More than 20,000,000 grommets are manufactured and placed in the sacks every year. Although the bags are made out of the most durable canvas, the government carries such a huge volume of mail every year that the factory must run without a stop to keep the postoffice supplied with sacks. Practically all of the manufacturing machinery is specially designed for its purpose. Like the government printing department, the mail bag factory saves Uncle Sam thousands of dollars every month through efficient large-scale production.

Stamping out the tops of postal locks.

Largest American-Built Airplane Carries 32 Passengers

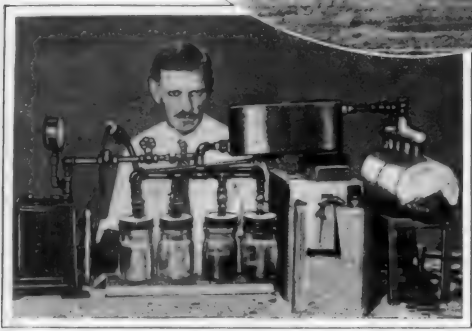
Designed to carry 32 passengers, the new Fokker F-32, shown above, is the largest airplane ever built in America and the largest land plane in the world. The photo shows 47 persons standing in line under the giant's wings and gives a good idea of its tremendous size. The huge ship successfully passed its trial flights before a committee of aeronautical experts. It is powered with four radial motors mounted in tandem under the wing. This type of power plant mounting, it is predicted, will soon displace the tri-motored type in which one engine is mounted on the nose of the fuselage where its efficiency is somewhat impaired.

Built-in furniture as an integral part of the decorative scheme will distinguish the apartment of tomorrow. Above is a built-in radio and phonograph with disappearing doors.

This faithful replica of a Viking ship stopped off in London on its way around the world.

Speeding Motorboat Endangers Crowd in Thrilling Upset

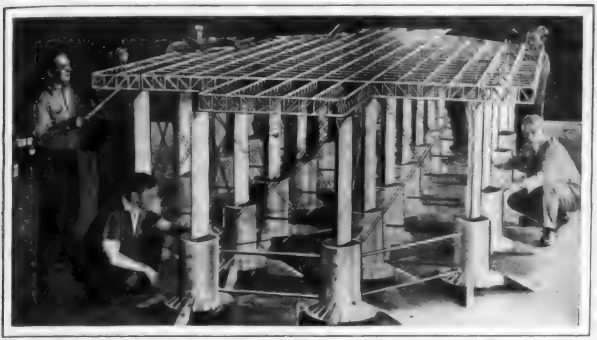
Spectators sought cover in a hurry when the motorboat Invicta II leapt the bank in a recent race at Rickmansworth, England. The remarkable action photo above shows the motorboat just as it bounced over the bank. Note the woman spectator underneath the boat. Fortunately no one was hurt—not even the pilot, who was flung out of his craft in making a sharp turn.



The plane shown above taking off at a sharp angle by means of automatic interconnected wing slots and flaps is the Handley-Page entry in the Guggenheim contest to determine the safest airplane. It is claimed that the wing slots make it impossible for the plane to stall or fall into a tail spin. The wing slots can be seen in the leading edge of the upper wing.

Old motor oil may become a source of new if the experiments of W. H. Herschel of the U. S. Bureau of Standards, shown above, perfects the apparatus on which he is working. It is claimed that oil refined by his process costs only two-thirds as much as new oil, and that it has a greater resistance to heat owing to the fact that unstable elements have already broken down.

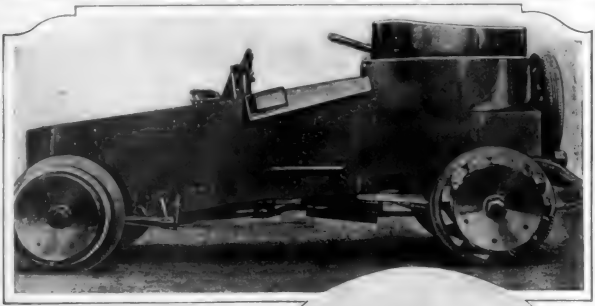
Seadrome for an Ocean Landing Field Nears Completion



The ocean seadrome designed by Edward B. Armstrong to provide a safe floating landing field for trans-Atlantic airplanes is shown above nearing completion in a Delaware shop. Only one of the units is shown in the picture. Hollow ballast-filled bases support the platform solidly in the water.

Novel forms of radio loud speakers are illustrated in this picture by E. L. Rice, Washington inventor who has been experimenting along this line. The tapestry on the wall forms a loud volume speaker; the photo easel contains more speaker cells, as does the pillow at his arm. In his hand he holds a vest pocket speaker, and in the vase is another packet which makes it a talking vase.

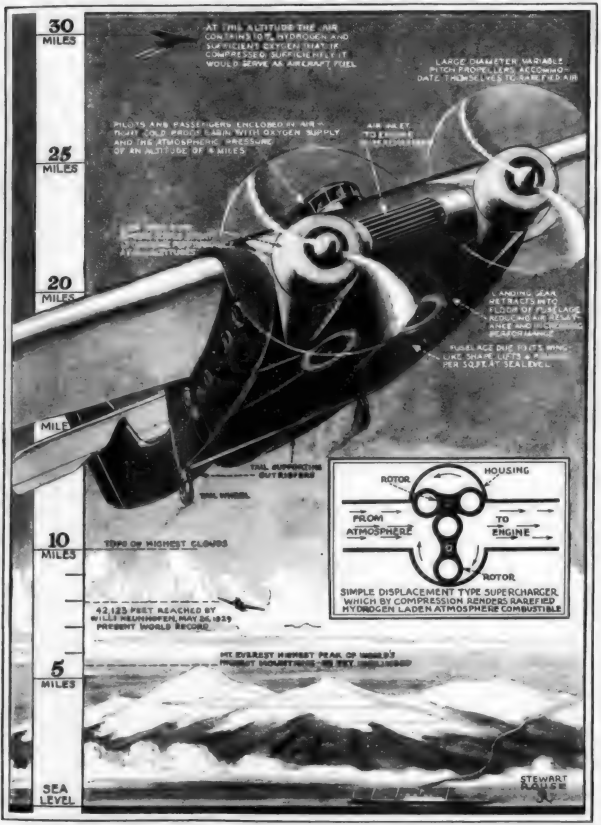
Army Tank Built on Auto Chassis Makes 45-Mile Speed



Built on an ordinary commercial auto chassis, the armored car shown above is the invention of Col. Bruce Palmer of Fort Riley, Kansas. It is a cross between a tank and an automobile. It can maintain a speed of 45 miles an hour and carries a machine gun on a flexible mount. In addition to the regular pneumatic tires there is an auxiliary set of solid rubber on which the car rides in case of punctures by enemy bullets. The circle at the right shows a close-up.

Spraying of insect-killing chemicals from an airplane is the method employed by up-to-date fruit raisers in eliminating plant pests. Photo shows plane with funnel-like device designed for this work.

Airplane to Run on Hydrogen from Air



Flying at a height of 25 to 30 miles, an airplane being planned by Professor Rondine, of the Department of Aeronautics at Leningrad University, Russia, is to take the hydrogen which exists at these altitudes and use it for fuel! Professor Rondine proposes to equip his plane with a compressor to catch the thin hydrogen laden air and condense it to a point where it becomes a good fuel.

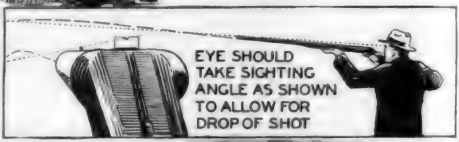
TIPS on Shooting

By TOM KENNEDY, *Firearms Expert*

WHEN you bang away at a streaking mallard this fall and the shots from your scattergun keep on going and the duck does too, don't feel foolish.

It's all in the game. Probably the duck is just a good old fashioned home-talent duck and doesn't know the fun he has missed. And probably you are just a home-talent shot. That's no disgrace, either, because there are a lot of little pointers in duck shooting that will improve your score.

Fr'instance, did it ever occur to you that you have to "lead" a little, and "follow through"? A mallard will be going about 80 miles an hour when he calls your shot. You have to train the gun a little ahead of



In aiming your gun at a flying duck, "follow through"—that is, keep your gun moving on the duck while you are pulling the trigger. In aiming, the eye should be about a quarter - inch above the stock of the gun at the breech.

With the blind a quarter of a block from shore, the white leader is placed a block from shore, the second half way between the blind and the leader, and the rest of the decoys close to the blind. The ducks will settle in the open water at an easy range of forty-five yards.

for the Duck Hunter

FLYING SPEED OF BLUEBILL - 50 M.P.H.

MALLARD FLIES ON UNDULATING LINE AT 80 M.P.H.

TEAL FLIES AT 100 M.P.H.

GUN TRAINED AHEAD OF DUCK TO COMPENSATE FOR BIRD'S FLYING SPEED

him, and keep right on swinging the gun as you pull the trigger. Most people swing, stop when they have a bead, and blaze away. So does the duck. It's like throwing a rock at a two-car express freight doing sixty. Maybe you'll hit the caboose if you aim at the engine. Lead a little; differently for the 80-mile mallard than for the 50-mile bluebill or 100-mile-an-hour teal. Keep the gun swinging as you shoot. That's follow through!

Early in the season you'll be shooting at local birds—light feathered. Use No. 6 shot. Later, when thick-feathered Canadian callers plop toward your decoys, use No. 5 and No. 4 shot. The white leader decoy, if you shoot from a blind, should be a block out. The next decoy about half a block in from him. The balance of the flock inshore from this fellow. Between the leader and the inshore duck the flock will settle. Then you can blaze away.

But—you're apt to shoot under 'em unless your eye is about a quarter of an inch above the stock at the breech. This is to make your line of sight correspond to the place the shot will finally hit. Your shot will tend to fall, hence the sight must be high. The drawings on these pages illustrate my points better than I can explain 'em. Look them over—and the next time you go duck hunting you'll come back with the limit.

Lead a little when firing. Different speeds of different birds are shown in the drawing above.

Artistic Hot Dog Stands Fostered by New Organization

This first prize hot dog stand can be built for $1,400 to $2,400 as designed by Wm. H. Frenaye, Jr.

This combined refreshment stand and filling station, designed by Henry Cobb, can be built for $3,700 to $6,200.

DESIGNING and construction of artistic hot dog stands and filling stations is being fostered by the new National Stand Owners' association of operators of roadside refreshment and motor service stations. Instead of waiting until the highways are further cluttered with temporary, nondescript eyesores, they have set out to dignify and stabilize their business by advocating more attractive and sanitary stations. Prizes of several thousand dollars were offered for the most artistic designs. The first prize for refreshment stand designs went to William H. Frenaye, Jr., of New York. The sales value of this design would be increased if the porch were placed at the end of the building and the counter carried around to permit sales outside of the building. It needs no sign to show that it is a roadside stand.

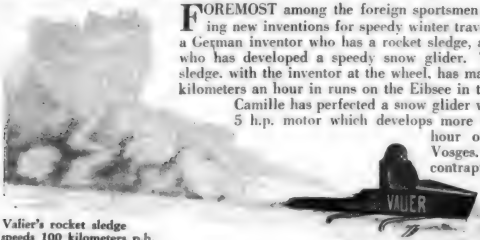
New Cars With Six Drive Wheels Defy Bad Bumps and Chuckholes

Car shown above has six rear drive wheels for rough riding.

BUMPS and chuckholes have no terrors for the new type of automobile pictured herewith, that has been developed in Europe and prepared for marketing. The six-wheel construction at the rear gives the motor truck or automobile the ability to cover the roughest terrain without difficulty. When the standard drive wheels are mired the secondary wheels grip the road and do the work.

Rocket Sleds and Snow Gliders Develop High Speeds

FOREMOST among the foreign sportsmen who are developing new inventions for speedy winter travel are Max Valier, a German inventor who has a rocket sledge, and Jacob Camille who has developed a speedy snow glider. The Valier rocket sledge, with the inventor at the wheel, has made more than 100 kilometers an hour in runs on the Eibsee in the Bavarian Alps. Camille has perfected a snow glider with propeller and 5 h.p. motor which develops more than 60 miles an hour on a lake in the Vosges. Interest in these contraptions is spreading.



Valier's rocket sledge speeds 100 kilometers p.h.

Max Valier's rocket sledge is being charged with rockets in the above picture for one of its trial runs on a lake in the Bavarian Alps. The sledge propelled by the exploding rockets, develops a speed of 100 kilometers an hour. The sledge is equipped with a head and back rest against which the inventor, Valier, rests when flashing across the snow covered ice.

Jacob Camille is shown on his new snow glider which he has been trying out with great success on a lake at Gerardmer in the Vosges. The glider is fitted with a motor driven propeller and can speed more than 60 miles an hour with its 5 h.p. motor.

SCIENCE BEATS

By KENNETH HAYCRAFT
Last Season's All-American End

Kenneth Haycraft, University of Minnesota's All-American end last season, crouching and ready for action.

Who tells how the intricate plays of a good football team are based upon sound mechanical principles. He points out the different mechanical principles a coach applies to give his offensive team superior driving power. Haycraft, as a member of Dr. Clarence Spears' famous Minnesota university bone-crushers, has discovered the superiority of science over brawn.

FOOTBALL decidedly is based upon mechanical principles. What would be more mechanical than a smooth working football machine—eleven units of brains and muscles co-ordinating to attain the perfect play in which every man performs his duty with one hundred per cent efficiency!

How many people—persons who think they know football—really do know just what goes on during a game? How many are not there simply because of the colorful glamor and excitement of the crowded stadium? And how many are not misled to believe that the man who makes the touchdown deserves the sole credit?

The majority of a huge football crowd is

An excellent example of an end run is shown above. Defensive linemen are out of the play, the red ball carrier, at the right, has interference in the red jersey men numbered 6 and 4 who will eliminate two defensive threats at the crosses.

Brawn in Football

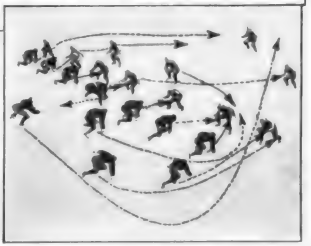
This photo shows the red offensive at the start of an off-tackle play. See how the offensive line has completely blocked out the defensive line and backfield men and the famous 3-year All-American Herb Joesting is about to eliminate the defense end clearing the way for the red ball carrier to cut back and pass between the end and tackle.

utterly oblivious to the inside story of a play. They think that they are carefully watching everything that is going on. Yet, most of them are stone blind to some of the most important phases of a game.

I remember vividly when I was a freshman playing in my first scrimmage against the Minnesota varsity. I was stationed at defensive guard, and the varsity was skirting our ends and driving through our line for large gains. Invariably, if one of their backs broke past the line of scrimmage, he would go ten or fifteen yards farther before being brought down.

I didn't play football in high school, and was therefore pretty green. I couldn't understand why our defensive backs couldn't stop the play without letting them gain so much ground after they had passed the line of scrimmage.

On the next play I watched out of the corner of my eyes. The runner was going to the right. That meant that his interference was sweeping to my left. They took our end completely out of the play and pinned our tackle in.



The diagram shows the lineup with arrows indicating the men to be accounted for by the offensive reds to make possible the play pictured at top.

A hole wide enough to drive a wagon into opened up, and the ball-carrier slipped through without anyone so much as touching him. Then I saw what was happening to our backs. The weak side of the varsity line had merely checked their opponents and then slid by and down the field. The end was driving our fullback away from the play. The tackle was lying on top of one of our halfbacks. The other halfback was wrestling with the guard. Our safety man had to come up from his position twenty yards behind the line of scrimmage to stop the runner.

Most spectators view a play like that during a game with their attention fixed on

Note how a football ends its flight and the correct pose of the safety man, legs spread, head up, eyes on the ball, arms close to body, hands out and up and relaxed.

the ball-carrier. They rarely see the mechanism that makes it possible.

Football a number of years ago was a game for giants only. Small men didn't have a chance, and brute force was an indispensable requirement. Science, strategy and the principles of leverage and balance were stressed to a considerably lesser degree on the gridiron.

Then, as interest in the game increased and more youths began to play, it gradually developed to its present state—the most thrilling and spectacular of all American sports.

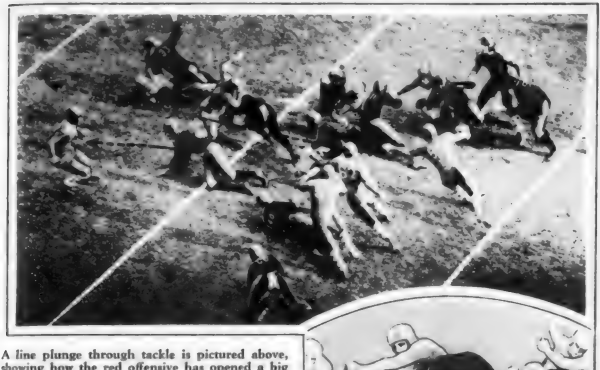
Smaller men, anxious to play, figured out the positions in which their bodies would have to be when blocking or tackling to get the maximum amount of power in their drives. Soon they were not only playing on even terms with larger men who depended solely on sheer strength, but were surpassing them in every phase of the game. Fast, quick-thinking players, regardless of brawn, were proving the most valuable asset to a team. Coaches began to pick the personnel of their squads on a different basis.

I do not mean to say that a small man is now given precedence over a larger one because the requisites of a football player have allowed him to enter the ranks. By all means, no! A good, clever big man is usually better and more valuable than a good, clever little man, although it depends to a certain extent on the positions which they play. But the advent of scientific methods of blocking, tackling, dodging and twisting has given smaller players an opportunity. It opened the game to more men. It made it a better sport to watch.

In its early stages, football depended far less on team work than it does today. Individuality in the general play of a team was expressed more. There were eleven men playing against eleven men—not one team against another.

A successful team at present is one in which the movements of each player are likened to the turning of a cog of an intricate machine. If one wheel slips, the efficiency of the machine is consequently impaired. And so it is with a good football team. If one man in the interference protecting the ball-carrier fails to take out an opposing tackler and allows him to stop the runner, his team loses ground as a result.

A Number of Tricks in Leverage and Balance Are Required of Players



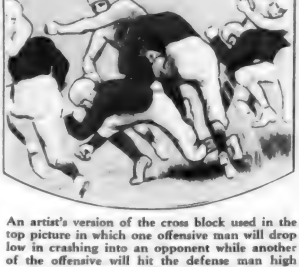
A line plunge through tackle is pictured above, showing how the red offensive has opened a big hole and the halfback timing himself with scientific precision races through the opening. Notice how the defensive men have been blocked out.

If two teams are evenly matched, neither should complete a perfect play throughout a whole game! A perfect play means that every member of the offensive team has taken out every defensive man. When a back makes a long run for a touchdown, it is usually the result of such a play.

Numerous tricks in leverage and balance make up the difference between the polished player and the "dub" or the clever man and the brute. The experienced lineman knows just how to lift an opponent who is playing too high, how to send him sprawling in order to open up a hole that his team's ball-carrier will have no difficulty in romping through.

He knows that when he is in a crouched position, his back should be parallel with the ground in order to get the most out of his drive, that one foot should be placed slightly forward with his weight evenly balanced between his hands and feet to get a fast start. His head should be up so that he can see where he is going. A veteran lineman can send a green man spinning by simply diverting his head when he charges blindly at him.

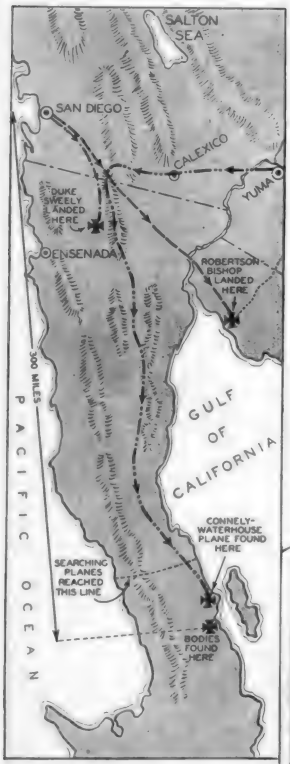
The cross-block is one of the most effective means of opening up a hole in an



An artist's version of the cross block used in the top picture in which one offensive man will drop low in crashing into an opponent while another of the offensive will hit the defense man high toppling him over speedily.

opposing line. If a guard and tackle of an offensive team were going to use it to take out one of the other team's guards, they would accomplish it in this manner: Instead of charging straight forward as he usually does, the guard would hesitate a few seconds after the ball is snapped while his tackle crossed in front of him and hit the opposing guard low. Then he would drive forward and hit his man fairly high from the other side. If executed correctly, the result, despite the size and strength of the opposing guard, would be simply a matter of leverage. He would be carried out of the play, and the offensive ball-carrier would hurtle through the hole left open.

HOW SKILLED BIRDMEN Get LOST in



Thrilling tales of pilots who doubted their instruments and depended on their hunches and consequently lost their lives or narrowly escaped death far from their destinations are told by one of the foremost aviators in the land. Major Arnold explains why aviators should have adequate maps, accurate calculations, checked instruments, and follow these rather than whims which make the flyer prey to drift winds and other things which may give surprising results. Amazing experiences are recounted in this unusual article.

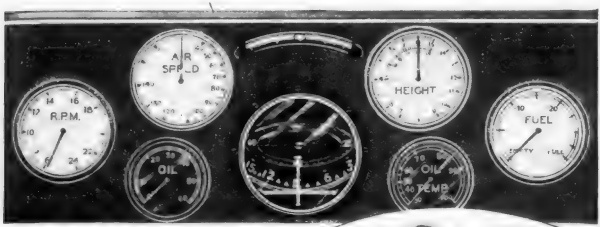
PILOTS of aircraft have compasses, clocks, maps; the sun may be shining; prominent landmarks such as rivers, mountains or an ocean may be visible; the airmen may have received instruction in navigation and yet few pilots can truthfully say that at some time or another they have not been lost. What are the conditions and circumstances which cause airmen, even very experienced airmen to lose their way in the sky?

Ten years ago practically all airplane pilots followed either railroad tracks or

Map of the southwest where pilots, confused by cross winds and mountain range east of San Diego, became hopelessly lost. At right Lieut. Robertson and Colonel Bishop who doubted their instruments and nearly died as a result.

the AIR

by MAJOR H. H. ARNOLD
Former Assistant Chief
Army Air Service



Pilots who become careless in watching as many instruments as shown on the board above and trust their own judgment often lose their lives.

water ways when they took extended cross country flights. One reason for this was the unreliability of the engines and the aircraft. Forced landings were the rule rather than the exception and it was far better to land near a railroad station than to come down miles from anywhere with a long walk to the nearest means of transportation. Then again few pilots could fly a compass course across unknown country with the equipment then available.

In recent years airplanes, engines and navigating equipment have been so greatly improved that they operate efficiently under practically any conditions which may be encountered. Maps are now available for pilots which cover all parts of the United States. Compasses are correct within a very few degrees and yet airmen still occasionally stray far from their course even though the flying conditions are ideal. Such flights are hard to understand in view of the record breaking long distance flights which occur quite regularly and of the daily trips made by aerial mail pilots through fog, rain and snow but no matter how perfect mechanical devices may be, mankind still makes errors.

It was about ten years ago that the United States Army established its aerial border patrol, extending from San Diego, California to Brownsville, Texas. Parts of the border are well marked by natural terrain features such as the Rio Grande River but other parts are devoid of any distinctive markings. The desert areas look the same

Major Henry H. Arnold, noted army aviator, tells of pilots who ignored their instruments, became lost and died or narrowly escaped death.

on botn sides of the border. During the period of the patrol, there were quite a few pilots who lost their way, were out of touch with civilization for days and a few lost their lives as a result of not keeping to their course.

The Rio Grande River is such a distinctive land mark that the Texas border should be readily followed. The New Mexican and Arizona borders cross mile after mile of desert land which has the same general appearance in all directions. The California-Mexican border is limited in extent as it is only about 150 miles long and is limited by the Gulf of California on the East and San Diego Bay on the West. Although a few airmen have been lost on the Texas

Diagram Shows How Wind Throws Airplanes Off Their Course

border, many more have strayed from their course in southern California.

Practically every Army pilot who has been lost during flight had considerable cross country experience, was flying a plane with a compass and was using maps covering his projected course. Consequently there are many lessons to be learned from their experiences.

In 1916 Lt. Robertson and Col. Bishop left San Diego headed for El Centro. They were flying a Curtiss JN-4. When nothing was heard from them for 24 hours it was a certainty that they had either crashed or were lost. A search was immediately started which lasted for about ten days. The search ended when Robertson walked into a party of hunters south of Welton, Arizona. Robertson was exhausted but saved Bishop's life by directing the searchers to the point on the desert where they had parted. They had lived for over a week on two sandwiches, four oranges and a gallon of water which they had drained from their radiator.

During their flight they had veered to the south, reached the northern end of the Gulf of California and landed after running out of gasoline. Upon landing the plane turned over on its back in the sand along the shore. They believed that they had landed along the northern end of the Salton Sea and it was not until they had walked several miles to the south and not seeing any signs of civilization, returned toward their plane, that they realized that they were on the gulf shores. The incoming tide had washed out their footsteps.

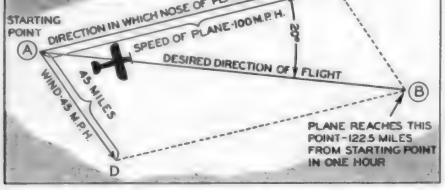
They were confronted by a ninety-mile hike back to the nearest railroad. They left the plane carrying such articles as they could and started the long hike over the desert sand hills. Day after day they plodded along directing their course by the sun during the day and by the stars at night. If Robertson had not run into the rescue party when he did it would have been just too bad, for both of the airmen were all in. Bishop was already in such a condition that he could not walk another step.

In 1919 there were two instances of airmen becoming lost in the same area. Lts. Duke and Sweely left San Diego with two passengers in two planes headed for Tucson. After a couple of hours flying they ran out of gasoline and landed in an unknown country. They had no idea as to their location and decided to remain by their planes as they believed that rescue planes would soon be out looking for them.

During a period of about 8 days they subsisted on such birds as they could shoot, a few grasshoppers and a young steer that they found wandering about. They cut the steer up with a safety razor blade and a bearing scraper. The cowling of the plane was used, after considerable bending, as a boiler for cooking the beef. This party was ultimately found by a cowboy and brought into Ensenada, Mexico.

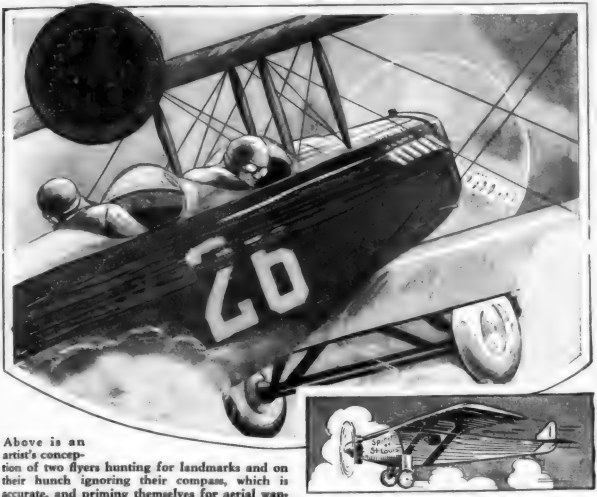
During that same year Lts. Connely and Waterhouse were flying Border patrol from Yuma to San Diego. They ran into a storm in the San Diego mountains and tried to fly around it. Their story can only be told by the markings found some six months later on their plane.

"Flew 4 hrs. and 5 min. Hit rain storm. Got lost. Hit coast in 1 hr. 30 min. Turned to our right and flew up coast for 2 hrs. and 35 min. Didn't see a sign of civilization all the way. Saw boat here, circled it and then landed but it went on. I guess they didn't see us. We have no food. Drinking water from radiator. Here 5 days now and are pretty weak. We will put mark for days here on left of this sign. We started walking up the coast. Walked



This chart by Major Arnold shows graphically how pilot must fly to make allowance for wind drift and arrive accurately at predetermined point.

"Believe Your Compass, Not Your Hunches," Says Colonel Lindbergh



Above is an artist's conception of two flyers hunting for landmarks and on their hunch ignoring their compass, which is accurate, and priming themselves for aerial wandering and perhaps disaster, whereas Colonel Lindbergh made his calculations, watched his instruments, believed them instead of his hunches, and flew across the Atlantic landing in France.

for a day and a half. Ran out of water and turned back."

Months later the tragic termination of their misfortune became known. When they were so weak that they could barely walk, a Mexican came ashore and took them in his boat. He put them ashore again that night and then murdered them. Searching airplanes reached a point within ten miles of their plane on the sixth day of their disappearance but the search was called off on the seventh day.

It is not only on the comparatively short border patrol flights that airmen have been lost. There were several instances during the epidemic of trans-oceanic flights a few years ago when aviators milled around in mid-ocean after having lost all sense of direction. There were other instances where the plane and crew were guided to their destination by one member who kept his head when others played hunches or were completely at a loss as to which direction to head the plane.

Experience in aviation is a bitter teacher but airmen as a rule learn more from experience than any other way. Unfortunately mistakes in the air too often have a tragic ending. Those who make the mistakes seldom have a chance to profit by their errors on subsequent flights but other aviators take advantage of every opportunity to learn.

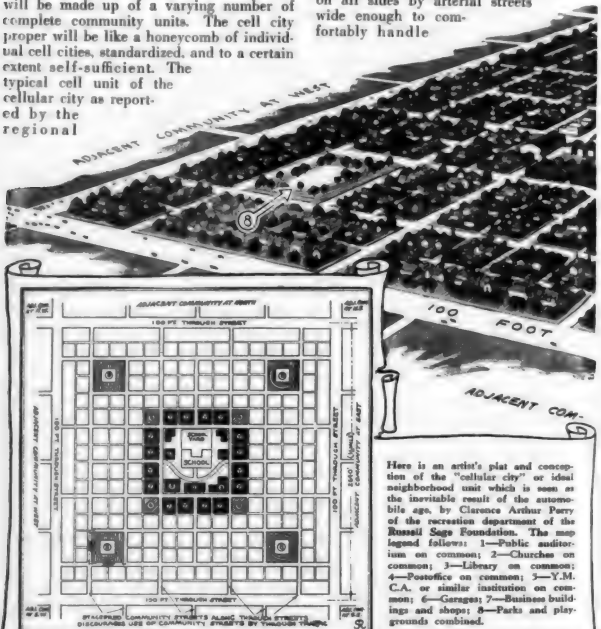
Generally speaking it is very seldom that a compass has an appreciable error. Once the drift of the plane is determined, the compass course will lead to the destination. It is rather difficult to determine exactly what occurs when airmen are lost. Alibis are so easily made and then again men lose all idea as to details after trying experiences while lost. Indications are that in every case of airmen lost along the border, the

(Continued on page 220)

CELLULAR CITY

HIGHLY modernized cellular cities are predicted for the future by the Regional Plan of New York and its Environs based on a 5-year study by Clarence Arthur Perry of the recreation department of the Russell Sage Foundation.

The cell city which is seen by Perry as the inevitable product of an automobile age will be made up of a varying number of complete community units. The cell city proper will be like a honeycomb of individual cell cities, standardized, and to a certain extent self-sufficient. The typical cell unit of the cellular city as reported by the regional plan would be a residential development providing housing for a population requiring one elementary school. The actual area of each cell would depend on density of population. This "cell" would be bounded on all sides by arterial streets wide enough to comfortably handle



Here is an artist's plat and conception of the "cellular city" or ideal neighborhood unit which is seen as the inevitable result of the automobile age, by Clarence Arthur Perry of the recreation department of the Russell Sage Foundation. The map legend follows: 1—Public auditorium on common; 2—Churches on common; 3—Library on common; 4—Postoffice on common; 5—Y.M.C.A. or similar institution on common; 6—Garages; 7—Business buildings and shops; 8—Parks and playgrounds combined.

An ideal regional community unit like the above with recreation spaces protected from hazardous auto traffic is planned for the future by experts.

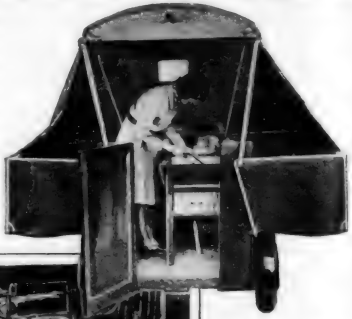
all through traffic. The "cell" would include its own system of small parks and recreational spaces, large enough to accommodate the population of the cell only.

Sites for the school, postoffice and other service institutions would be grouped in the center of the "cell." One or more shopping districts adequate to serve the population of the neighborhood unit would be located in the circumference of the "cell," preferably at the traffic junctions and adjacent to similar districts of adjoining neighborhoods each laid out on the same general scheme.

The unit should be provided with a special street system, each highway being designed to facilitate circulation.

Novel Camping Trailer Opens Into Comfortable Quarters

A NOVEL camping trailer has been produced in London which is hailed with delight by lovers of the outdoors because of the comfort it provides. The trailer, compact when closed, is attached to the rear of the automobile by a device which makes it ride easily with a minimum of side sway. But when camp is made the sides of the trailer let down to increase the available space and a door at the end provides access to the interior where there is ample headroom.



The trailer with sides let down provides plenty of room and ample head space for the chief cook of the expedition. There is ample width for bed space.

The compact trailer, closed, and ready for the road, is shown above.

Ash Receiver on Gear Shift Lever

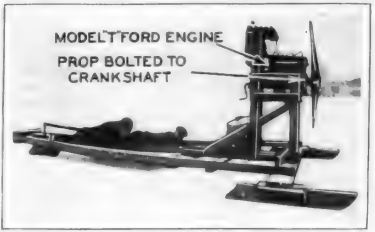
AN ASH receiver at the driver's finger tips has been invented by an automotive manufacturer to be attached to the gear shift lever, replacing the gear shift ball. The receiver is made of heavy brass and nickel and enameled in assorted colors. The novelty is constructed to withstand hard usage, be useful, and add a colorful touch to the car equipment.

Radio Follows Bird Migration

THE age-old problem of where birds go in winter may be solved by the assistance of radio. Prof. Johannes Thienemann at a bird station at Rossitten, East Prussia, was able, by means of requests for information via microphone, to get valuable check-ups on the movements of a group of storks released after number bands had been attached to their legs at the beginning of the fall migratory season last year. Band numbers sent in by interested members of his radio audience showed that five days after the storks' release on September 26, they were in the Carpathian mountains of Czecho-Slovakia. By October 10 they were near Messini in the southwest of Greece, having flown approximately 1250 miles in two weeks, almost due south. This checks previous experiments with stork migrations made in Germany, but the use of the radio naturally speeds up considerably the process of gathering the required information.

Fast Ice Boat Built With Scraps and Old Model T Engine

LOUIS HEUPEL, of Cleveland, Ohio, wanted a fast ice boat. He had an old Model T Ford engine and didn't want to make a sail so he set to work. Using scraps of lumber, metal and a variety of available bolts and screws he built the framework for the craft. Then he took the junked motor, pepped it up considerably, had a small crankcase made for it and bolted the propeller to the end of the crankshaft. Placing his motor, rigidly bolted to the upper framework of his craft Heupel was ready to go.



An old Ford engine hitched to propeller drives this ice boat. Trials on Lake Erie showed a speed of 50 miles per hour.

Largest Saxophone Seven Feet Tall

F. W. KIMBALL, of Oakland, California, who is six feet one inch in height, has acquired the largest saxophone in the world, one nearly seven feet tall, with a bell 17 inches in diameter, for symphony work.

Saxophone is taller than this six-foot musician.

$4,000 For the Bark of One Tree

THE highest-priced bark in the world is the distinction claimed for a variety of cinnamon tree that grows in the province of Thanh Hoa, French Indo-China. The tree reaches a height of 30 or 35 feet, and bears a white-spotted bark. When the tree is stripped, the bark is divided into three parts. That from the upper portion of the trunk is esteemed most highly, and that from the base the least. The king claims two-thirds of the bark from the upper two-thirds of the tree as his own; the rest is auctioned off. The bark of a single tree brings as much as 100,000 francs, which even at post-war exchange rates means $4,000. The Chinese and Annamese native doctors supply an avid market for this bark.

Hunger Measured by Balloons

SWALLOWING small rubber balloons after fasting from 15 to 44 hours, and then causing intense pangs of hunger by taking an insulin injection, sound like making a martyr of oneself for science. Yet this is the program submitted to by a number of men in the laboratory of Prof. A. J. Carlson and Dr. P. Quigley, of the University of Chicago. The insubstantial meal of balloons was taken so that the movements of the digestive tract might be measured. The rubber bubbles were connected with the outside world by means of slender tubes, to which instruments were attached for the measurement of changes of pressure in the balloons caused by contractions of the stomach and intestine.

PATENTS ~ Nutty

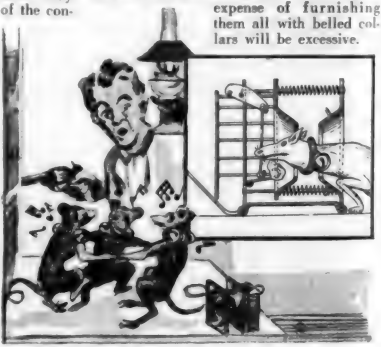
Maybe you don't believe that the inventors of the devices shown on these pages went to the trouble of securing patents on them, but they did, every one of them.

Hurricane Cable Anchors Houses to Ground to Resist Storms

WHAT couldn't have been done for the leaning tower of Pisa with the anchoring cable shown in the drawing above! Too bad the idea was patented about 400 years too late to do the leaning tower any good—and in the meantime it went right on leaning and got itself famous, being the originator of that now famous stunt. Almost any old farm has a barn or house which is stealing the leaning tower's stuff, and this anchoring cable is just what they need to take the leanness out of them, or at least that was the idea of the inventor who patented the device. He claims that his cable will hold a house tight to mother earth in the severest storm, and no doubt he's right, but what house wants to be held down in a hurricane when all the other houses are flying away to play? Put one of these little cables in your home and you can go to sleep nights secure in the knowledge that you will awake in the morning without finding yourself blown into the next state.

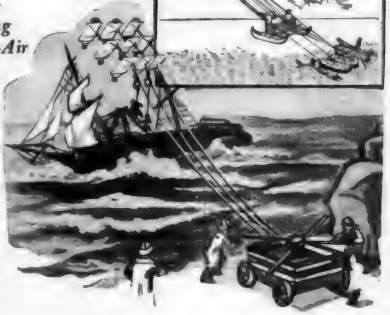
Inventor's Machine "Bells Mouse" and Scares Rodents Out of House

THE old nursery tale about the belled cat who was to scare the mice away must have inspired the inventor of the contrivance shown at the right. All the mouse or rat has to do is poke his neck through the trap after the piece of cheese and presto! two halves of the trap come apart and release a circular spring around the rodent's neck, to which a bell is attached. When the mouse runs home all the rest of the family run away quick, because mice don't like bells; they think they're rung by ghosts, or something. The lonesome mouse with the bell who is left is quickly tracked to his lair by the tinkling sound he gives forth at every step, and when he is slain with shotgun or revolver the house will be entirely mouseless. Of course, if the mice should happen to enjoy the sound of the bell and decide to start an orchestra, the expense of furnishing them all with belled collars will be excessive.



or NOVEL?

Kites Hold Man-Carrying Cables Suspended in Mid-Air



WAY back before the day of the airplane—in 1889, to be exact—a Massachusetts inventor patented a device which he described in his application as "An Improved Aerial Apparatus for Navigating the Air and for Towing Vessels and Vehicles Over Water and Land." The picture at the right shows the novel outfit anchored to the shore while its cables extend out over a wrecked vessel from which it is rescuing the poor sailors who ran on a rock. This is only one of the numerous jobs at which the apparatus is claimed to excel. Another use is pictured in the upper inset drawing, taken from the patent application itself, in which a trusting pair of adventurers are riding in a carriage suspended from the cables while the kites pull them across the Atlantic. Note the canoes on the bottom of the platform to keep the men afloat in case of a forced landing. Balloons on the topmost row of kites are supposed to lift the kites into the air, after which everything is in the hands of nature. One trouble with this form of navigation is that the passengers have to go in the same direction the wind blows. But the device isn't only good for carrying passengers over water; it is supposed to tow ships, pull people over the ice on a sled, tow passengers across country on a drag, and help ship captains navigate their boats. Imagine Lindy hopping the Atlantic in one of these rigs!

Folding Metal Clamp Holds Receiver to Ear in Lazy's Man's Telephone

Snooze while you talk with this phone!

PEOPLE whose conversation over telephones is more or less confined to listening, such as hubby receiving a call from friend wife, will appreciate the advantage of the patented receiver clamp shown in the pictures at left. When the receiver is lifted from its hook it is automatically held in place beside the ear by a bracket which leaves both hands free. A clerk can talk over the phone, make change, write up orders and scratch his head all at the same time with this rig. With a phonograph record to say "yes" every two minutes, this telephone is practically a perfect machine for taking long distance orders from the boss.

DEEP SEA

Whales with headlights to illuminate the blackness of the ocean one mile down, fish with eyes gazing upward and discharging violet rays downward, and other strange monsters of the deep captured by Dr. William Beebe on unusual expedition off Nonsuch Island, Bermuda.

This prized picture, copyrighted by William Beebe, is of a young silver hatchet fish, whose batteries of violet lights point downward while its eyes look upward as it darts about near the ocean's bottom.

JET black whales with headlights to show them the way in the darkness a mile under the ocean's surface, great fish with "batteries" discharging violet rays downward while their eyes peer straight up, and fish with grappling hooks attached to the mouth, are among the monsters of the deep captured during the summer months by Dr. William Beebe, famous American naturalist, director of the Bermuda Oceanographic expedition of the New York Zoological society, off Nonsuch Island.

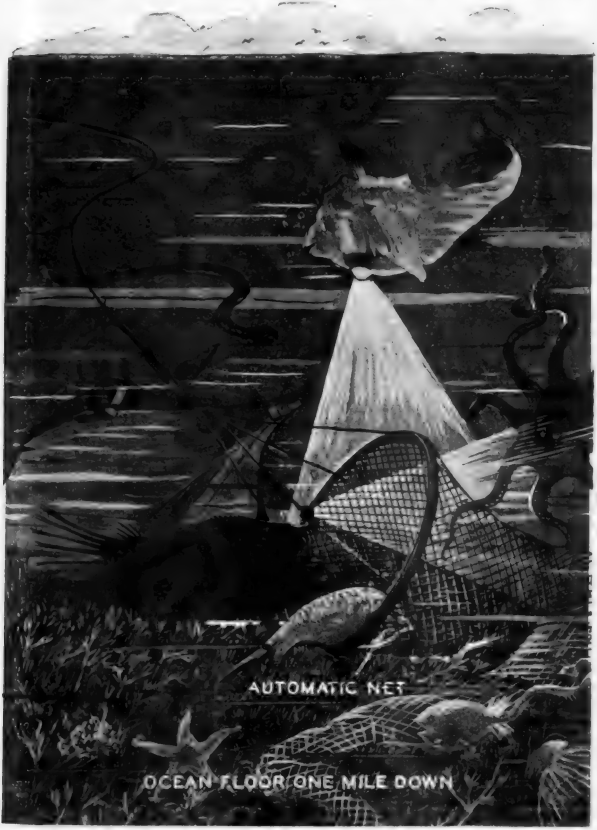
Modern science and mechanics were drawn on the fullest extent during this expedition which has accomplished unexpected results. Hundreds of varieties of deep-water fish, including scores of specimens heretofore unknown and unclassified were captured at the direction of Dr. Beebe.

Some of the most difficult problems of the expedition were the extraordinary and fantastic forms of some of the deep sea devils. Until this expedition only two fish with lighting apparatus were known and these were shore fish from the East Indies. These two both had a sac or bag below the eyes containing what was supposed to be a mass of luminous bacteria. One specimen was fitted with a film of black pigment which it could draw up over the light.

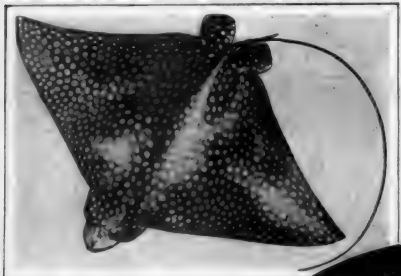
But now as a result of Dr. Beebe's most recent triumphs many deep-sea fish with electric lighting apparatus are known, indicating that fish had outdone man by ages in developing lighting. Some of Dr. Beebe's specimens of the so-called *electric* fish were found 500 fathoms (3,000 feet) under the surface, where all living creatures are accustomed to constant blackness.

One jet black whale was captured which had a headlight rising like a periscope from the top of its head and casting a brilliant beam of light forward in the darkness. Another variety of fish was found with the ability to discharge violet lights downward from its body. This is the young Argyropelicus, or silver hatchet fish. Scientists are making an exhaustive study of these fish to determine in detail the means of emanating these light rays. Particularly interested in this fish was Dr. Newton Harvey of Princeton University, accredited expert on

DEVILS *Trapped by Science*



Strange fish equipped with lighting apparatus to illuminate their way in the jet blackness a mile under the ocean's surface were captured in automatically closing nets on the Beebe expedition.



This queer native of deep south sea waters is the spotted eagle ray of Bermuda, whose spine is intensely poisonous. The photo is from Dr. Beebe's copyrighted collection.

the light of deep sea organisms, a staff member of the expedition.

At one time a rare fish was found in Icelandic waters. It had two flaps of skin attached to two parts of its body without apparent design. Inside the skin flap was only one organ. This specimen was a female some two feet in length and the male of the species was never found. But now Dr. Beebe has discovered the young of both sexes—an extremely remarkable catch. Both the male and female are perfect in form and miniatures of the full sized fish. The male, captured by the Beebe expedition has a fierce array of small grappling hooks attached to the mouth.

One of the rays taken on the expedition is of the spotted eagle variety which has an intensely poisonous spine. This ray comes from an interesting family which includes the electric ray, or torpedo. This ray has many of the properties of an electric battery. By some marvelous means it has produced electric cells from the muscles of its body, which enable it to stun and kill a fish.

The electricity from this fish will decompose water and actually produce a spark. How the electric power of the ray affects other fish may be indicated by the fact that an electric ray which was captured and opened contained a two-pound eel and a one-pound flounder. Other rays have been found containing four-pound fish in their stomachs.

The electric apparatus is made up of two sets of tiny hexagonal cells, some 400 to the set, at the base of the pectoral fins.

Results of the expedition indicate that the deeper down the blacker the fish and one of the unusually interesting specimens is a great black eel captured

An illuminated, white, soft, bizarre-shaped fish from a mile down is shown in one of the Beebe copyrighted pictures. This fish is being studied for classification by scientists.

thousands of feet down. This eel has an enormous mouth. Although it is only a short distance south of Bermuda that European eels breed there are none of these among the eels captured by Dr. Beebe. The new variety has not been known heretofore and although many of the deep sea monsters are huge in size the eel is the longest of all.

One of the new devices utilized by these scientific deep sea fishermen was a radium lure. The radium was used as a luminous coating on hooks attached to sounding wires about a mile long in depths where there is no daylight. Perhaps no fisherman has ever had a thrill such as that experienced when there was a "nibble" on this lighted hook and the first catch was raised, a squid, which is a member of the octopus family.

Dr. Beebe said that so far as he was aware radium lighted fish hooks had never

Scientists Fish One Mile Under Surface With Radium Lighted Hooks

Above are shown some members of the Beebe expedition during office hours; members of the party in the western laboratory on Nonsuch Island, examining specimens brought up from deep in the sea. Left to right are, Dr. and Mrs. Charles Fish, John Tee-Van, William Beebe, and Gloria Hollister.

Specimens of strange aquatic creatures are shown being examined by Seige Chetznkin, taxidermist, on the left, and Dwight Franklin, artist. The specimens are rare species of the Moorish idol, surgeon fish, squirrel fish and angel fish.

been used before. The glow-hooks he uses are nearly a foot long and he hoped to catch some unusually gigantic deep-sea monster. That there are amazingly huge creatures of the deep has been indicated by the presence of huge scales in nets lowered into the blackness—but the nets have never been strong enough to hold the deep sea devils.

One of Dr. Beebe's chief troubles was that his field of research off Nonsuch Island, Bermuda, was too rich. During his expedition he pioneered for as a rule modern expeditions of the kind find little that is absolutely new and are devoted to a more accurate study of what is already known. But Dr. Beebe and other members of his expedition found about as much that was new as that which was old.

Dr. Beebe used the same method of intensified study that he utilized in his scientific work in the jungle and this is the first time in the history of science that a single spot in the ocean has been studied so thoroughly.

The Beebe expedition is one of the most completely equipped ever to undertake such a study of under water life. The equipment includes many unusual devices such as the luminous fish hooks mentioned; mile-long wires and cables; specially devised nets with trap mouths designed to close when some of the mile-deep fish stray into them despite the "headlights" with which some of the fish are equipped.

The paraphernalia includes costly cameras, deep sea diving equipment and laboratories for examination of the fish. When a catch is brought up it is studied by eminent scientists for classification purposes, examined in the laboratories, preserved, painted from life by artists, revealing as many of its secrets as science can demand.

Edited by MAJOR H. H. ARNOLD

Finest Silk Withstands Tremendous Strains in Parachutes

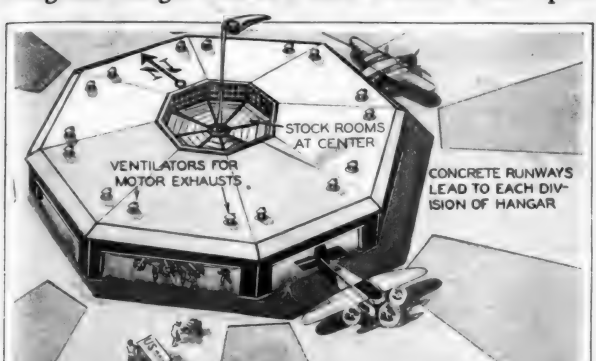
OF ALL the equipment of airplanes and aviators perhaps none is so important when needed and yet is so fragile as the parachute. The silk used in parachutes is the finest quality of Japanese thread obtainable and yet when completed in parachute form withstands a tremendous strain. Aviators have been known to drop for a distance of over 8000 feet before opening their chutes and yet the silk withstood the strain of sudden opening when the aviator was falling at the terrific rate of 200 miles an hour! On the other hand, the silk rapidly deteriorates when exposed to moisture, if retained in its pack when damp, or otherwise abused.

The standard adopted for silk cloth for parachute use in the United States Army weighs less than ½ ounce per square foot, has a tensile strength of 40 pounds along the warp and 60 pounds along the woof, and withstands a rupturing force of 160 pounds per square inch. The standard chute is 24 feet in diameter and requires about 60 square yards of silk to make it. Thus the parasol part of the chute which supports the aviator in the air weighs only 17 pounds.

When Major H. H. Arnold speaks of parachutes, as he does above, he knows what he is talking about. The above photo shows him strapping on his chute preparatory to taking up an Army plane. During the war Major Arnold was assistant chief of the Army Air Service.

Experience has shown that these chutes should be opened for inspection and repacking every month. During this monthly inspection every part is carefully gone over to determine the extent of wear and tear. While the pack is made of heavy canvas and webbing, the parachute itself in ordinary service outwears the pack. The life of a chute in the United States is about 5 years and in the tropics about 3 years, but the packs must be replaced every year. This wear on the pack is the result of its being used as a seat for the aviator. When the silk cloth in the chute will no longer withstand a rupturing force of 125 pounds per square inch, the parachute is declared unserviceable. The parachute when worn by the aviators is a clumsy, awkward affair but few if any of the Army airmen would willingly go up in a plane without one. The seat type chute is perhaps the most popular, in which the aviator sits upon the pack. An interesting fact discovered by government experimenters is that a man falling from an airplane cannot attain a speed of more than 200 miles an hour, regardless of the distance fallen.

Octagonal Hangar Houses Planes Without Waste Space

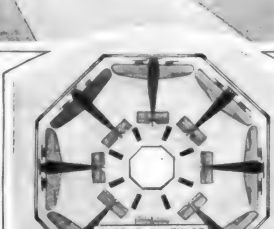


An airplane hangar with six or eight sides, as shown in the above drawing, is the latest suggestion of engineers for housing a large number of airplanes in a small space.

WHENEVER a new aviation field or airdrome is planned there always arises the problem as to the type of hangar which should be erected. If the aviation field is planned for a small town or for a limited number of planes the problem is simple but when a modern airdrome with unlimited aerial traffic is contemplated, conditions are different. In this latter case the maximum amount of shelter must be provided with the minimum amount of space taken up. It is obvious that hangars can not be erected at random around the field.

Commencing with the hangars of 20 years ago attempts have been made to secure economical housing for airplanes. In order to provide shelter for these aerial vehicles which have a most unfortunate shape in so far as hangars are concerned, engineers have produced 'T' shaped, square and rectangular buildings. All of these types have their disadvantages and most of them have considerable waste space.

Recently the hexhangar made its appearance. This type has a hexagonal or octagonal ground plan. It provides the maximum amount of floor space for airplanes and at the same time is very convenient. Any plane can be taken out without moving any of the others. Each of the six sides has a door and each door opens to accommodations for one plane. The centre of the building can be used for office space. store room, machine shops, or pilots' and mechanics' rooms. To date it seems to be by far the most economical and convenient hangar produced.



This overhead view of the octagonal hangar shows the extreme minimum of waste space inside the hangar.

Four Types

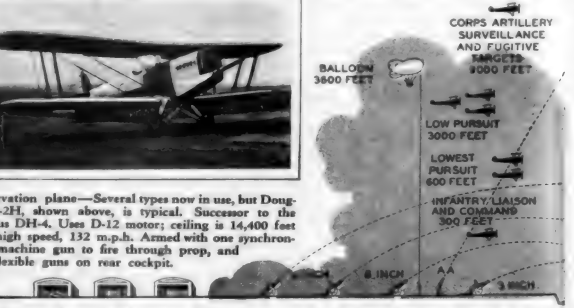
Attack plane—Curtiss A-3, with 430 h.p. D-12 motor. High speed, 141 m.p.h. Armed with 6 machine guns of 30 caliber. Two of these are mounted in the lower wings, two are synchronized to shoot through propeller, and two are on flexible mounts in the rear cockpit.

Pursuit plane—One of several types used by the army. Engine is standard or super-charged D-12. Ceiling is 32,000 feet and rate of climb is first 1100 feet in one minute. Armed with two synchronized machine guns.

Observation plane—Several types now in use, but Douglas O-2H, shown above, is typical. Successor to the famous DH-4. Uses D-12 motor; ceiling is 14,400 feet and high speed, 132 m.p.h. Armed with one synchronized machine gun to fire through prop, and two flexible guns on rear cockpit.

NO ONE type of airplane can possibly serve the various purposes demanded of fighting planes by the army. Certain planes must be fast for combat work; others must be able to carry heavy loads, such as bombers; and still others must be built for special purposes. For this reason the army uses four types of warplanes, as pictured on these pages—pursuit, attack, observation, and bombardment. A fifth type of plane is used for transport work, but no photo is shown inasmuch as a number of different makes are used, mostly tri-motored Fokkers or Fords. The transport plane is the latest type adopted by the army, and is used for transporting personnel and supplies from one point to another.

Missions of the various types of planes may be visualized from the diagram below. Pursuit planes operate in groups from about 30,000 feet down to ground level. Their mission may be offensive patrol to drive away enemy planes, or to escort bombers or observation planes. Observation planes fly at altitudes above 10,000 feet to take photographs, adjust artillery range and secure information for



This diagram shows the missions of different types of aircraft in wartime and gives depth behind the lines to which different types of artillery can fire. The diagram is not drawn to scale but is intended only to give an idea of the comparative effectiveness of different types of weapons.

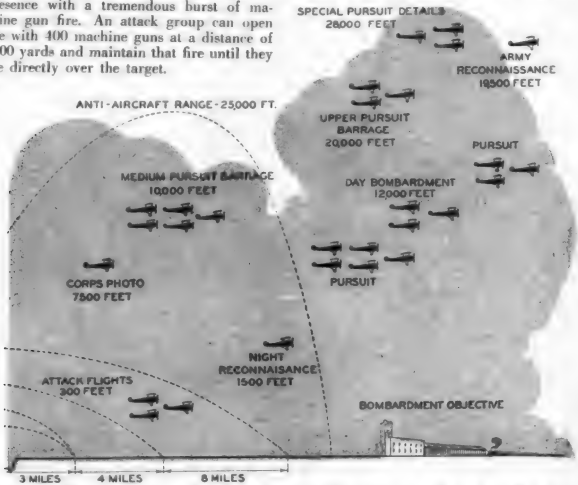
# of ARMY Warplanes

the army. At lower levels other planes of the type perform similar duties for the Corps and divisions. They also perform courier service and carry officers on special missions.

Bombardment planes fly 10,000 feet or higher during the day to carry out their missions. Night flights are made at lower altitudes, between 2,000 and 8,000 feet. Pursuit planes may or may not be sent along for protection. Bombing planes always fly in formations in which each plane is protected by machine gun fire from others in the group.

Attack planes fly closer to the ground than any of the others. They are weapons of opportunity. They secure best results when they can appear suddenly and announce their presence with a tremendous burst of machine gun fire. An attack group can open fire with 400 machine guns at a distance of 1000 yards and maintain that fire until they are directly over the target.

Bombing plane—Twin-motored Keystone. Uses either 400 h.p. Wasp or 525 h.p. Hornet engines. Ceiling with full load, 13,325 feet. High speed, 114 m.p.h.; radius of action, 7½ hours or 345 miles from airdrome. Can carry one 2000-lb. bomb or two 1100-lb. bombs or equivalent weight in smaller bombs. Armed with five machine guns; carries a crew of four men.



Pursuit, observation, bombardment and attack planes are well shown in the above diagram in their special fields of activity. Note that the fast pursuit planes climb to the highest ceiling with their supercharged engines, while the attack planes skim along only a few hundred feet above ground.

HOUDINI'S *Mystifying*

By R. D. ADAMS
The Mechanic Who Made Houdini's Trick Magic Apparatus

Recognized as the Master Magician of his time, the great Houdini performed tricks of magic which were the marvel of millions. Only one man knows the secrets which Houdini carried to the grave with him. That man is the mechanic who made Houdini's illusion-producing apparatus, who concludes his expose below.

OF ALL the stunts performed by Harry Houdini, perhaps none was more mystifying or brought forth more impossible explanations of his method of accomplishing it than his celebrated trick of the vanishing elephant in which a full size animal was made to disappear from the stage of a crowded theater instantaneously.

After making the elephant go through an act that would have done credit to a wild animal trainer, Houdini led the pachyderm behind a framework and with appropriate patter, fired a pistol. Instantly the elephant vanished.

Some say it went through a trap-door, but there was a tank of water under the stage of the New York theater in which the trick was performed. Anyhow, a trap-door could never have been utilized for the purpose. The frame around the elephant hid the secret of his disappearance.

The rising blue curtain snapped up in a flash, hiding the elephant behind it.

Have you ever touched a window shade with a nervous spring? Such accidents occasionally cause bathroom tragedies.

The curtain rolls up so quickly your eye cannot detect it. The lower part of that framework about the elephant which was well back on the stage, hid a roll of cloth identical with that immediately behind the elephant. Above in the flies was a heroic-sized shade roller whose spring, especially built by a Chicago firm, had to be wound up by two men. Straps running down the sides of the frame behind which the elephant stood, connected with the roll of cloth below. As the shot was fired, the audience probably blinked. In any event, its eyes were not keen enough to see that curtain jerked into the flies with lightning speed by that giant spring. With the background unchanged and the elephant invisible, the illusion was complete.

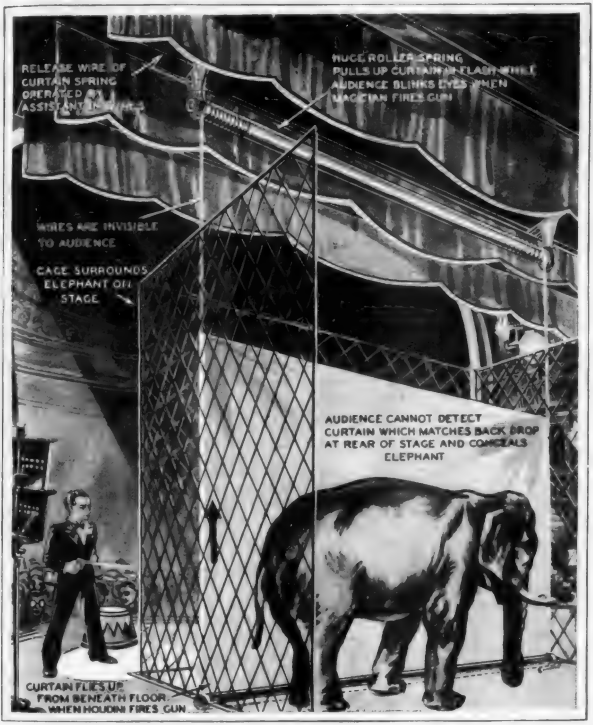
Two or three years before Houdini died, I was talking with him about some of the outstanding feats of magic I had seen performed when I was a boy and asked him if he knew how Keller had done a mind reading stunt which had always mystified me. Oddly enough, Houdini himself had the trick in mind and was then considering the advisability of amplifying it and introducing it in his act if he could find the proper kind of an assistant. And the assistant had to be a real specialist as you will see. Here is the trick and how it was performed, as Houdini explained it.

Keller would have a lady assistant sitting on the stage blindfolded, as usual, while he would pass through the aisles and ask her to name various articles he held in his hand. At first the answers were merely "a fountain pen," "a lady's purse," "a gold bracelet." Then he would hold up a newspaper. "Give the name, date and volume number."

Quick as a flash she would answer accurately.

A spectator would be asked to copy the serial number of one of his pieces of cur-

Magic Stunts EXPOSED



When Houdini fired his gun a curtain was snapped up in front of the elephant by a powerful spring. The curtain was painted to match the rear of the stage so that when viewed from the front the elephant had apparently vanished. The curtain flew up in the split fraction of a second while the audience involuntarily blinked its eyes when Houdini discharged the revolver.

tency on a piece of paper so that Keller might hold it up for others about him to see.

"What is the number?" he would inquire.

"577762."

"Correct," he would return. "Now multiply it by 7453 and extract the square root

of that sum." Tall mental arithmetic, that!

Mathematicians in the audience would be requested to take their pencils and determine if the answer was accurate. But they would hardly have the multiplication started before the blindfolded assistant would call out the correct result.

And there was no fake about that feature of it either, except that the lady did not do the figuring herself.

Up in the flies was a dwarf with an uncanny mind for figures such as are found occasionally. He could extract the cube root of a number in twelve figures in a flash without the aid of paper or pencil and had at one time been billed himself as "the human adding machine." The dwarf, with the aid of a special device combining the features of both a telescope and microscope which Keller had made in Germany at the cost of several thousand dollars, from his secret place in the flies kept his glass trained upon Keller through a peephole in the curtains. Since he could see any article in Keller's hands as well as the magician himself could, and was a master at mental arithmetic, it was very easy for him to pass the correct answers down to the lady on the stage through a small speaking tube which ran under the rug and up through the chair on which she was seated, connecting with a receiver hidden beneath her hair.

Suspended in Mid-Air

Among the tricks Houdini worked in his earlier days was the "Aerial Suspension Mystery" which had a Hindu origin but was first introduced to the stage by Robert Houdin, from whom Houdini took the name he was to make world famous. Despite its antiquity, the stunt is still worked occasionally and never fails to intrigue an audience.

The performer brings forth a heavy plank 5x2 feet standing upon legs six inches high to demonstrate that it is not connected with the stage floor. In the center of the platform he places a stool upon which steps a young woman who is to be the subject of "Hypnotic" demonstration. She extends her arms full length with the palms of her hands pointing downward. A brass pole of appropriate length is placed beneath either arm a few inches from the shoulder. The magician makes a few "hypnotic" passes. The young woman's face takes on a fixed expression. Slowly her eyes close. The trance is complete.

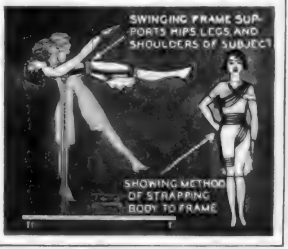
The magician kicks the stool from beneath her feet. She is undisturbed by the incident. He removes the support from under her left arm. The lady still sleeps, her position unchanged. He removes the brass rod from beneath her left arm. There she remains like Mahomet's coffin, suspended between heaven and earth. Gently the performer takes his subject and bends the right arm until the palm of her hand rests against the side of her head. He then tilts her body until it forms an angle of thirty degrees with his own. He raises her feet again until the angle is sixty degrees. Still she rests comfortably. Another elevation and her body is parallel with the floor of the stage and five feet above it.

How is the illusion produced? When the brass pole at the lady's right was placed under her arm it was fitted in a socket in the plank. The one on her left was merely held there by the pressure of her arm. In her clothing was a hinged steel rod to which she was attached by a body harness which passed around her waist, between her legs and over her left shoulder. The lower end of the bar was fastened securely by a belt around the right leg well above the knee. Near the top of the bar, which was hinged at the position of her arm-pit, another belt was drawn about her right arm just below the shoulder. There is a hole in the top of the pole under the lady's right arm. On the end of the bar to which her harness is strapped, is a steel plug extending at right angles which the performer slips into the slot at the top of the rod but which is hidden by the end of the subject's short lace sleeve dropping over it.

Removal of the stool and the rod to the sleeping beauty's left of course means nothing. The pole on the right only seems to have been removed. What the magician actually took away was a brass shell covering an iron rod painted the same color as the curtain immediately behind it and blending so completely with the background that the audience does not see it. The hinge under the girl's armpit will take several different positions since it is controlled by a ratchet governed by a check held in place by a spring which the performer may release by a downward pressure on a hood also hidden beneath the girl's clothing. This

Invisible Metal Rod Supported Subject Supposedly "Floating" in Air

How is the girl suspended in mid-air? A metal rod, painted to match the background and therefore invisible to the audience, supports her. The base fitting of the rod can be seen in platform.



Positions of the subject's body at various stages of the illusion, and the method of strapping to the framework, are shown in the above diagram.

accounts for the various angles at which the girl's body rests during the several stages of the performance.

Such were the tricks which made Houdini the great master of his craft—so great that many refused and still refuse to believe he did not possess supernatural power.

Strange enough, though he spent many years and thousands of dollars exposing false mediums, Houdini was not convinced that it is impossible for the spirits of the departed to return. On the contrary, he was inclined to believe that they can do so. He sought many times to obtain communication with friends and relatives who had passed on and he promised many of his intimates to appear to them himself, after death, if it were possible.

"With all of the insistence of the gullible that you are in league with familiars," I once said to him, "it seems strange that you tried to disillusion them, rather than insist that they were in error. What a fortune you might have cleaned up. Were you ever tempted to do so?"

"I was very sorely tempted once," he replied, "tempted almost beyond my powers of resistance." He gazed out of the window

This is Rasputin, "The Mad Monk," the charlatan who so deluded the Empress of Russia that he became the acknowledged power behind the throne. Only for a trick of fate the great Houdini might have succeeded him!

reflectively, then continued:

"Perhaps if I had been money mad, I would have closed my career, rich beyond the dreams of avarice and the world's greatest charlatan."

Then he explained that while he was in Russia, the news of his exploits had made a tremendous impression upon the mystic mad empress. She was convinced that he was possessed of supernatural powers and that he might be of great assistance to the Russian throne.

"A Russian of great distinction," he said, "came to me and explained the situation. He did not know, or care, whether I was a medium. He only knew that Rasputin, the clumsy peasant libertine with his crude trickery and his hypnotic powers, was the real ruler of the empire. If I would accept, he would make it possible for me to supplant Rasputin in the favor of the empress and through her with the czar.

"No fortune I could hope to gain in any other way would be a tenth part of the reward that would be mine if I accepted. I asked for time to think it over.

"The sensation my act was causing had the entire country by the ears. A committee of dignitaries waited on me. They had definite assurance that the czarina would cast aside Rasputin for me if I would only announce that I was able to accomplish my feats with the aid of the supernatural.

"How easy I could have deceived her! I was commanded to appear before the emperor and empress. Then at a dinner held in my honor, a toast was proposed to the czar and the czarina. I am a teetotaler, as you know. I had left my glass turned down and I, merely raised it empty when the others drank. My actions were misinterpreted as a slight to the monarchs, and Rasputin, to whom the czarina had spoken about me several times, made the most of the incident. The commanded appearance was recalled. Disappointed but not discouraged, the tempters who desired to make me the premier charlatan of Russia begged me to wait for a more propitious moment and that they would yet make me the favorite of the court.

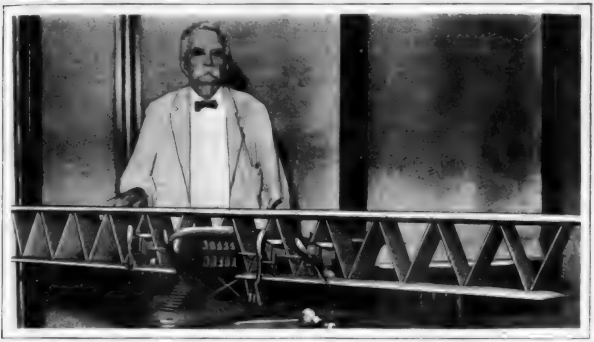
"I left Russia, promising to return when they were ready for me. But I had no intention of doing so. Once away from the country I saw how utterly absurd it would have been to sell my birthright of trickery even for such a stupendous price. I could not have lived the lie that would have been necessary even though the world had been the reward.

"Yet, I, a Jew—hated of the Russians—might have been the real ruler of the vast country. Perhaps, after all, in view of the destruction to which Rasputin led the empire, it had been better for me to have accepted.

"'You, at least,' one of the Russians who wished to have me installed at court had argued, 'are not a madman; you will not, you could not be the terrible menace to our country that Rasputin is.' And, of course, I could not have been. It may be that I, had I superseded the mad monk, could have gradually disillusioned the mystical empress. Had I possessed the 'mediumistic' power to foresee what Rasputin would do to the country, I might have stepped out as Rasputin's rival. By so doing, perhaps I could have saved an empire from complete collapse." And so he might.

(This is the third and concluding article of Mr. Adams' fascinating series on Houdini and his secrets of magic. The first article appeared in the October issue of Modern Mechanics and Inventions.)

American Will Build Airplane to Carry 125 Passengers

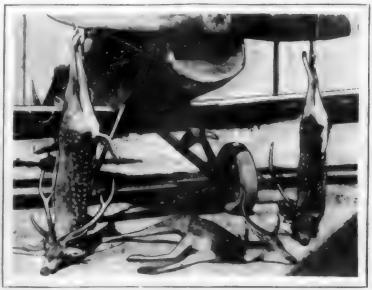


Colonel T. L. Eggleston is pictured with the model of the gigantic airplane he plans to build, a ship capable of carrying 125 passengers. The airplane is to have a wing span of 140 feet.

NOT daunted by his age of four score years Colonel T. L. Eggleston, of Enid, Oklahoma, is making plans for the construction of a million dollar airplane. He has planned to make the ship capable of carrying 125 passengers. The craft will have eight engines and 140-foot wingspan. The engines, housed in four cabins will drive eight propellers, four of the tractor and four of the pusher type. The passengers and pilots will be housed in a large central double-deck cabin. Colonel Eggleston plans unusually sturdy struts, carefully designed throughout to offer a minimum of resistance. The central cabin will be arranged to provide a maximum amount of comfort for passengers who may be carried long distances aboard the great ship.

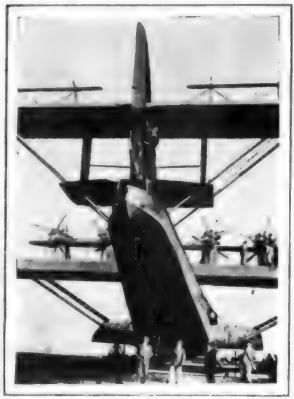
Hunters Are Using Airplanes in Tracking Deer in the Hawaiian Islands

MODERN deer hunters in the Hawaiian Islands are now using airplanes in which to track deer. The pilot sweeps low over the earth in finding deer runs and although the airplane motor may frighten the deer the hunters return later, landing near the runs and carefully stalking the animals until they are able to get in their shots. The use of airplanes is eliminating much of the discomfort heretofore undergone by hunters and enabling them to get successful results in a much shorter period. The native hunters, however, have little time for these modern innovations.



Above is one day's "bag" of deer for airplane huntsmen.

Dornier Twelve-Motored Ship Groomed for Ocean Flight



This unusual picture shows a stern view of the 12-motored Dornier flying boat. Note the man beside the rudder.

HAVING proved itself airworthy in test flights, the huge Dornier-built flying boat DOX is now undergoing finishing touches to fit it for a flight across the Atlantic, probably from Europe to South America. The DOX is the largest flying boat in the world, being powered with 12 radial motors of 500 horsepower each which are mounted in tandem on its upper wing. A full description of this marvel of the skies appeared in the October MODERN MECHANICS.

The remarkable photo at the left, taken from the rear of the ship, gives a graphic idea of the proportions of the tail assembly. The elevators on the DOX are as large as the main wings of the familiar Ford tri-motored monoplane. The boat-like fuselage supports a weight of 100,000 pounds when the plane is loaded. And its builder, Dr. Dornier, does not regard his plane as having reached the ultimate in size. Far from it; he predicts that seaplanes of the future will approach the dimensions of present-day ocean liners.

Various factors, such as the need for huge landing fields, limit the size of landplanes to comparatively small dimensions beyond which they may not profitably be built. Seaplanes, however, always have a perfect landing field beneath them. Ships such as the DOX are designed to weather storms of gale intensity without damage, the motors being mounted 30 feet above the water line and the hull being built of metal like an ocean steamer.

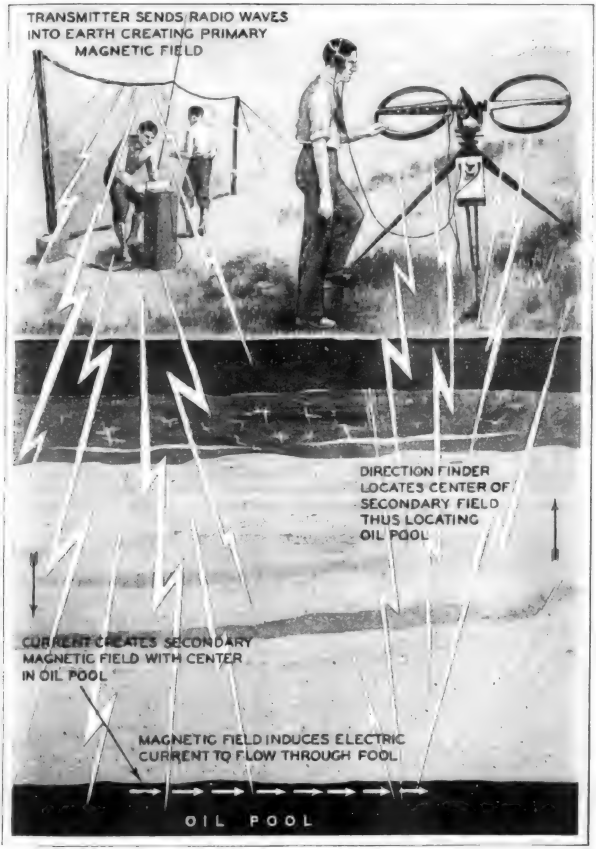
New Toaster Works Automatically

TWO slices of bread can be toasted at once to any predetermined degree in a new automatic toaster recently placed on the market.

Bread is inserted in holders in the door, as shown in the photograph at the right, bringing the bread between the heating elements when closed. A dial on the front of the machine regulates the length of time the current is left on, determining whether the toast is to be light or dark. Pressure of a lever turns on the current and starts the timing device operating.

When the toast is ready, the current is shut off automatically and the door falls open, permitting the toast to be removed. If not immediately removed, it is claimed that the toast is kept warm for some time by residual heat. Timing mechanism of the machine is designed to be trouble-proof, operating with a rotary action rather than clock escapement. Another feature of the device is the fact that the timing dial of the machine can be adjusted while the toaster is in operation.

Finding Oil by Radio Is New Scientific Feat of Prospectors

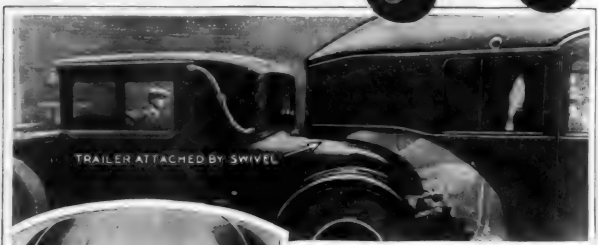


Science has brought radio waves to the aid of oil prospectors in Southern California. Above is an artist's illustration of how low-wave transmitting apparatus is used to locate oil under ground.

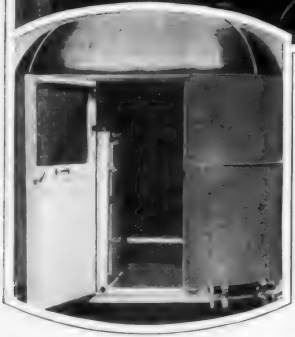
Glenn Curtiss Designs Fast Aero Car for Air-Rail Services

More comfort and speed for air-minded travelers crossing the continent.

This trailer has no front wheels and is attached to the coupe to provide comfort for the passengers.



The trailer is attached by a swivel arrangement over the rear axle of the coupe giving a three-point suspension body for the aero car.

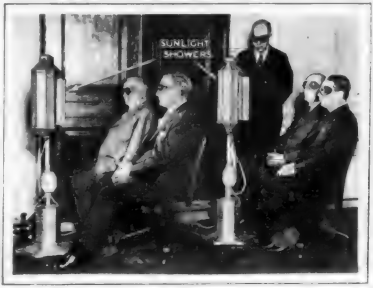


A door at the rear provides easy access to the aero car which also has side entrances to an interior that is luxuriously finished and appointed with a view to providing the best for the air-rail travelers who transfer from train to airplane and vice versa in these aero car coaches which speed between the landing fields and the depots.

GLENN CURTISS, pioneer pilot and sea-plane builder, is the designer of the new aero car which he introduced in Florida. A fleet of these aero cars has been placed in service by the Transcontinental Air Transport at their various fields and terminals for the air-rail service between New York and Los Angeles. The cars are especially adapted to the coupe by a swivel arrangement over the rear axle of the coupe giving the passengers a three-point suspension body to ride in. There are no front wheels on the trailer which is luxuriously fitted. The transfer unit is adapted for speedy transfer of passengers from landing fields to railway depots and vice versa. These aero cars form an integral part of the T.A.T. fast air-rail service from coast to coast taking the passengers by rail at night and by airplane in the daytime.

Sun Light Shower Baths to Pep up Weary Congressmen

CONGRESSMEN in Washington now resort to sun light baths in the turkish baths of the House of Representatives office building when they become jaded. Weary from their intensive work and political worries congressmen find that these sun baths restore their "pep." The lights, when the treatment is taken for ten minutes each day, give the patient the same benefits as if he were spending a couple of weeks at one of the southern winter resorts. Not only do the lights invigorate, but they also give the patient an artificial tan. These same kind of lights were used to treat the King of England. The busy men do not find it necessary to disrobe to derive the full benefit of the sun shower baths and seated before the showers the health-giving rays bathe them from head to waist. Masks are worn over the eyes as a protection from the powerful rays.



Congressmen Florian Lampert, Wisconsin; Frederick N. Zihlman, Maryland; George J. Schneider, Wisconsin, and Clarence J. McLeod, Michigan, are shown above, left to right.

Wood Acids Corrode Sheathing

THE creosoted wood conduits in which lead-coated telephone cables are sometimes cased for protection may, under some circumstances, become a menace instead of a means of preservation, according to R. M. Burns and B. L. Clarke of the Bell Telephone Company. They told of discovering in the air contained in such conduits appreciable quantities of volatile acids capable of corroding the lead sheathing.

Useful Acids Made From Sawdust

INDICATIONS of a possible future use for sawdust are contained in a paper by Prof. W. H. Peterson, R. J. Allgeier and Prof. E. B. Fred of the University of Wisconsin. They have discovered how to make the powdery wood waste into acetic acid. The first step was turning it into sugar, which was done by treating it with a strong chemical. Then the pulp was treated with a carbohydrate-converting enzyme, contained in malt sprouts. Finally, the process was completed by the addition of a micro-organism that has the power to ferment both hexose and pentose sugars into acid.

Chimpanzee Plugs in and Gives Wrong Numbers on Zoo Switchboard

Dick, a chimpanzee, becomes a "hello" operator.

DICK, one of the chimpanzee residents of the Luna Park Zoo in Los Angeles, California, paid a call to the zoo office the other day and while there he made friends with the telephone operator. When invited to try out the switchboard, Dick pushed and pulled plugs, particularly enjoying using the plugs when a light flashed on the board. He dispensed wrong numbers with carefree abandon and gibbered back at irate phone users who tried to "bawl him out" for his carelessness. He was removed from the chair, however, before he had an opportunity to raise a mob of protesting callers.

Win Your Wings

Every month for a year Modern Mechanics will award a complete free flying course to some young man or woman. All expenses including transportation to and from the training school and living while there will be borne by the magazine for the dozen winners who will become pilots. Complete rules of the contest are announced herewith. The only cost to you is the stamp for your entry. The first Modern Mechanics contest pilot is now flying alone.

Will you soon be soloing one of these modern training ships?

MODERN MECHANICS has already trained one young man to fly. He is Fred Resico of Mt. Clemens, Michigan, 19-year-old winner of the first "Win Your Wings" contest. He has completed his training without having to expend a dollar and is now back at his home, the proud holder of his pilot's license. You, too, can win your wings for twelve more young men or women are to be given free flying courses by MODERN MECHANICS.

All you have to do to enter Contest No. 3 is to find the six questions on aviation scattered through the advertising sections of this magazine, answer them according to the rules printed on page 95 and send them in with the filled out entry blank. You may win one of three prizes: First, a complete flying course with expenses paid; Second, a leather air-mail helmet; Third, a pair of non-shatterable aviator's goggles.

The winner of the flying course in addition to having all of his flying course expenses paid by MODERN MECHANICS will be given his railway transportation to and from the flying school and his living expenses while in training. Helmet and goggles will be given to the winner and all other necessary equipment will be loaned by the flying school.

The flying lessons will be given by licensed transport pilots, using dual control ships of the latest type which are regularly inspected by government officials. The lessons will be given at whichever one of the following schools is nearest the winner's home community: Shank Flying School, Minneapolis, Minn.; the Von Hoffman Aircraft Co., St. Louis, Mo.; the Aviation Engineering School, New York, and the Western College of Aviation, Los Angeles, Calif.

Winners of second and third place will receive their prizes promptly.

MODERN MECHANICS is conducting a separate "Win Your Wings" contest every month for a year and there are no restrictions barring you from entering every one of the contests although only one flying course will be awarded to an individual. The contests are wide open to any young man or woman who is 16 years of age or

at OUR EXPENSE

Fred Resico, Jr., who won one of Modern Mechanics' free flying courses, is shown as a full fledged flyer waving from the rear cockpit of the Waco ship he was taught to fly by Gene Shank who is in the forward "office."

more and a resident of the United States, except, of course, that members of the magazine staff are not eligible.

This magazine has always aggressively supported aviation and that is why, with its complete plans for constructing light airplanes, and other aviation features not equaled elsewhere, it has won such an outstanding place in the publishing world. And because of MODERN MECHANICS' firm belief in the great future of aviation it has been decided that this means be used to help in the development of the industry.

There is a constant cry for more pilots. There are not enough trained pilots to meet the demands of the industry.

RULES OF THE CONTEST

Scattered through the advertising pages of this issue of Modern Mechanics you will find six questions dealing with aviation. For the best letters containing answers to these questions, as determined by the contest judges, prizes will be awarded as announced elsewhere on this page. Neatness, originality, and adequacy of answers will be guiding factors which will help the judges determine the winners.

Anyone may compete who is 16 years of age or over, and a resident of the United States. Members of the staff of this magazine are, of course, not eligible to enter. Address your letter to Flying Contest No. 3, Modern Mechanics magazine, 501 Seventh Avenue South, Minneapolis, Minn. Entries must be postmarked not later than January 1, 1930, to be eligible for this contest. Clip or copy the entry blank below and attach it to your letter. Fill in the information requested. Include a snap shot of yourself, if possible—a big photo isn't needed; just a kodak print.

It is not necessary to buy a copy of the magazine to compete. In case of a tie, duplicate prizes will be awarded. Fill in the entry blank, find and answer the six questions, and send in your entry now. Don't forget to include your photo!

ENTRY BLANK

My name is .....

Address .....

Age ..... Height ..... Weight ..... Sex .....

If under 21, please answer the question below:

Will your parents consent to your learning to fly? .....

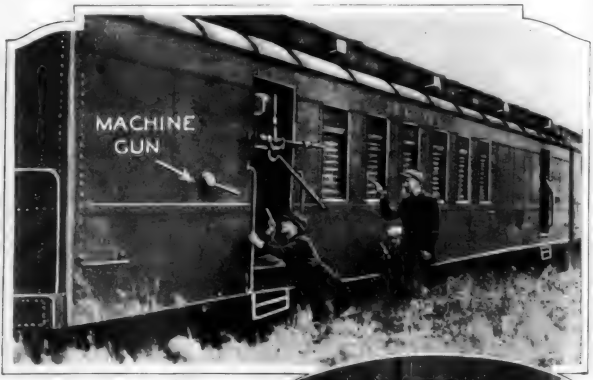
Parent's signature .....

Attach your answers to the six questions, and your photo, to this blank. Mail before January 1, 1930, to

FLYING CONTEST NO. 3

MODERN MECHANICS MAGAZINE, 501 SEVENTH AVE. SO., MINNEAPOLIS, MINN.

TRICKS that TRAP



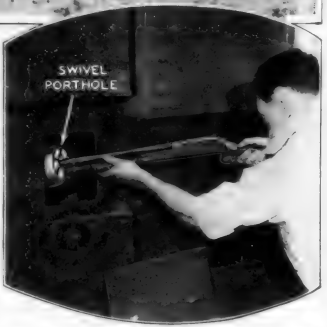
Armoured mail cars with safety loop holes for machine guns, rifles or shot guns.

Postal inspectors "never lose their man," because they use tricks like the vari-scenting of mucilage to trail certain thieves and keep everlastingly on the trail with a variety of methods of detection.

By C. MORAN

A SERIES of thefts of the contents of registered mail was reported to the Chief of Post Office Inspectors at Washington. An inspector assigned to the case limited the area of pilferage to half a dozen post offices. He arranged secretly to have the mucilage at the different stations given faint traces of various scents—lilac, violet, lily of the valley, mignonette, rose, and heliotrope. The next time a theft was reported the inspector smelled of the resealed flap and the thief was speedily apprehended.

Simple enough! And it is by the use of such simple methods that the United States



A mail clerk in an armoured car is shown with rifle sighted through a swivel loop hole.

Post Office Inspectors have achieved the world-wide reputation of "never losing their man." These inspectors claim no special powers of divination; they keep everlastingly after the culprit. No case is closed until the thief is dead or behind prison bars.

The fact that every mail thief sooner or

MAIL THIEVES

Sooner or later every mail thief must use the mail and many are captured through clues found in undelivered mail on the revolving sorting table in various postoffices, or in the dead letter office.

Inspectors guard great piles of mail such as this.

later must use the mails to correspond with friends or relatives puts the Post Office Department in an especially strategic position to apprehend criminals. Virtually every post office is a detection agency, having been notified of the theft and furnished with a description and photograph of the criminal. One day the thief, about to mail a letter, walks into the arms of a Post Office Inspector. Much of the efficiency of the inspection force is attributed to the fact that the inspectors are recruited from the rank and file of the vast army of postal employes in the approximately 16,000 post offices scattered over the country. Thus, each inspector has an intimate knowledge of the mails and has become a student of human nature through his daily contact with the public. The official inspection staff numbers 535, but practically every man in the postal service is a potential inspector.

Periodically the inspectors are brought to Washington where pending cases are reviewed and the evidence re-examined for fresh clues. Experiments are conducted with new devices intended to safeguard the mails, as for example the placing of tear gas bombs in post office safes. The bandit is rendered helpless by the gas when the safe is opened. Experiments are made similarly with bullet proof vests for railway mail clerks, armored mail trucks,

alarms for post offices, and armored railway cars.

Many mail thieves have been apprehended through clues found in undelivered mail. Thus, an undelivered letter was found to contain five $10,000 bonds that proved to be part of the loot of a mail robbery. The thief was traced through the letter and later sent to jail.

The arrest, conviction and sentence to life imprisonment of the three DeAutremont brothers brought to a successful conclusion what is regarded as the greatest man hunt ever conducted by inspectors of the Post Office Department.

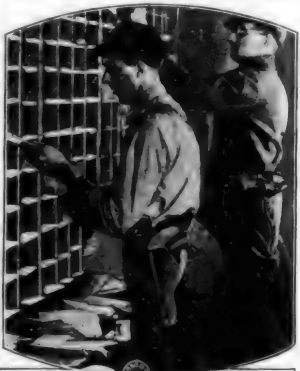
On October 11, 1923, the south bound Southern Pacific passenger train No. 13, was held up in a tunnel just beyond Siskiyou, Oregon. The mail car was dynamited; the mail clerk, engineer, fireman, and brakeman were murdered. Conclusive evidence showed that Roy, Ray and Hugh DeAutremont, three brothers, who lived at Eugene, Oregon, had committed the crime.

Two million five hundred thousand circulars, containing photographs and general description of the trio were sent out by the Post Office Department to every part of the civilized world.

Nearly four years later Hugh DeAutremont was captured in Manila. He had enlisted in the army under an assumed name. Renewed efforts were made to capture the remaining twin brothers, maritime officials in every seaport town being notified to be on the lookout for the criminals.

Four months later the twin brothers were apprehended at Steubenville, Ohio, where they had been working in a steel mill. They had also worked at an automobile factory in Detroit. Following this they had gone to Hanging Rock, Ohio, where they had hoped to lose their identity by having one, Ray, marry a local girl.

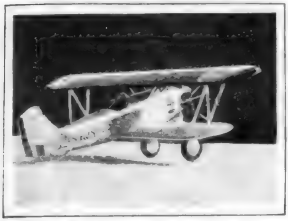
The amount of money and securities lost in the mails through the depredations of bandits is infinitesimal compared with the millions upon millions of dollars worth of securities entrusted to the care of the Government in registered packages which are delivered safely. During the war practically $50,000,000,000 worth of Liberty Bonds issued by the Government were carried through the mails without losing one.



Postal clerks and inspectors are expert marksmen and four are shown at regular pistol practice above. At the top armed clerks are at work.

Model Airplane Contest Winners

$50 in prize money is split among the five lucky entrants in Modern Mechanics' scale model airplane contest whose names appear below.

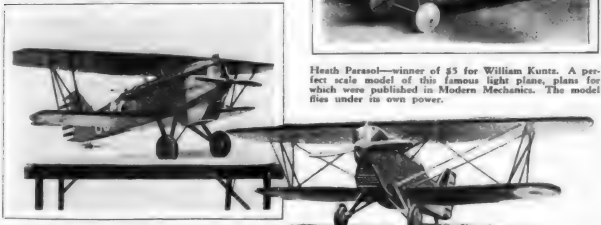


First Prize Winner—Curtiss Sea Hawk built by Ralph Pickard. Is complete with all controls, upholstered cockpit, inspection patch, aluminum cowling, gas tanks, Wasp engine with bayonet stacks and Curtiss hubless wheels.

MODEL airplanes by the hundreds poured in on the editors in response to the scale model contest announced in the August issue. The surprising part about all this deluge of airplanes was the uniform excellence of craftsmanship shown by their makers, and the contest editor had no easy job in determining the winners. First prize of $25 was won by Ralph Pickard, 11031 Maple Ave., Inglewood, Cal., for his excellent model of a Curtiss Sea Hawk. Second prize of $10 went to M. Charles Farrell, 3711 McClintock Ave., Los Angeles, Cal. Three third prizes of $5 each were awarded to Norman Zapf, Rocky River P. O., Cuyakaga County, Ohio; William Kuntz, 250 N. Pershing Ave., Indianapolis, Ind.; and Robert McKee, 702 Ridge Ave., Zanesville, Ohio. Photos of the prize-winning models appear on this page, accompanied by a brief description.

Second Prize—Built by M. Charles Farrell. Semi-cantilever high-wing monoplane. Has wing and cabin lights. Control surfaces operated from rudder and dep control. Nine-cylinder radial motor has more than 200 parts.

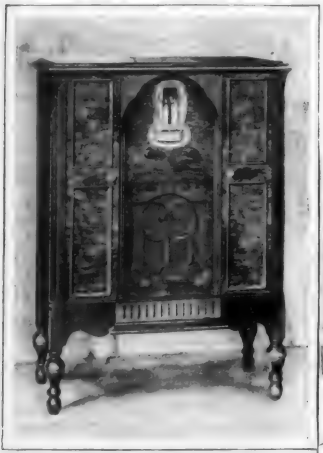
Heath Parasol—winner of $5 for William Kuntz. A perfect scale model of this famous light plane, plans for which were published in Modern Mechanics. The model flies under its own power.



Curtiss Army Hawk, winner of $5 for Norman Zapf. Has 4 foot wing spread; weighs 25 pounds. Fuselage and tail made of brass tubing, fabric covered; wings have wooden ribs and spars. Electric motor drives propeller.

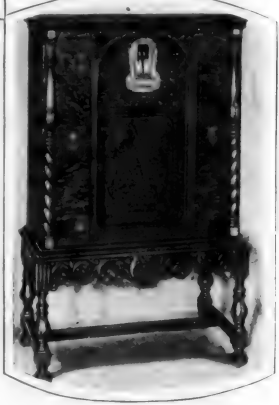
Another Curtiss Hawk built by Robert McKee, who won $5. The picture could easily be mistaken for a small photo of the full size plane.

Self-Tuning RADIOS



Milady demands one dial sets.

Radio buyers now look upon sets as quality pieces of furniture rather than judging them by circuits or by the number of "features" they possess. Gone are the tinkerers! A radio such as the one at the right sells for about $300, of which value two-thirds lies in the beautiful walnut cabinet work. Note the one dial tuning.

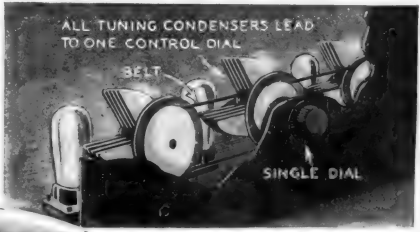


THE new 1930 radio sets will be first of all, beautiful. The most marked change in trend in winter buying of radio sets, according to a large number of radio dealers, is that the emphasis has changed from interest in a radio set as a piece of machinery, to demand that it be a piece of furniture. In the past, most radios have been sold because the buyer wished to get things over the air. This condition still exists, but coupled with it is the fact that the buyer now also wants his radio to be handsome as well as practical.

This desire to have ornamental radios has stimulated the desire for those encased in cabinets to such an extent that the dealers

to be Fan's Choice in 1930

Gone are the tinkerers who used to buy sets. Music with one dial whirl is wanted today. 1930's sets will carry one dial or automatic tuning to be up to date.



Here's how an intricate set of tuning condensers is hooked up to give one dial controls. Belts are usually employed as they are non-conductors.

Accenting manufacturers' answers to the public demand is this ultra fine, ultra simplified set with but one dial for tuning and tone control. One knob does all the tuning work here.

now advertise and sell the so-called console sets to a greater extent than ever before and claim that before long nearly all the sets sold will be of this type.

The women in the families are responsible for this trend, largely. Formerly the man in the family bought the radio set, and did not mind its looks. Also, he might be mechanically minded and liked to tinker with his machine, making all sorts of adjustments himself. But his wife, with less mechanical interest, wanted a set which she could turn on, set at a certain spot and listen to. This of course has simplified the mechanical parts of radio sets. Practically all the 1930 models are one dial sets, with a minimum of dial turning to get the desired station.

The old tinkerer, or radio enthusiast, has not entirely passed away, but he usually has two machines now, dealers say. He keeps his old machine, to play with, adjust, take to pieces and put together again. But he also has another one, or is buying one this winter, which won't get out of order, and which he can turn on and forget about.

Another growing development in next year's radio sets is the all electric set, the one which can be plugged into a wall socket. The old fashioned battery set is almost passing out of existence, in the cities and towns which have electricity. Manufacturers are still making a few of them, for use on the farms and in the villages where electricity is not used in the homes, but in the larger cities and towns a battery set can hardly be sold. In a survey made recently among nearly four hundred radio dealers in the middle west, all reported that they sold over 99% all electric sets.

Airplanes Used to Speed Supplies in Ontario Gold Rush

AIRPLANE service from Hudson, Ontario, to the land of gold recently discovered at Red Lake, in Northern Ontario, Canada, a distance of 130 miles, has been inaugurated. The plane makes the trip in two hours and carries freight at $1 per pound to men participating in the gold rush.

A dog team is sketched in the foreground of an actual photograph of an airplane at Red Lake with supplies for gold hunters to contrast old and new means of northern transport.

Water Traffic Cop on Duty

HERR HAMMER, water traffic cop on the Wannsee lake near Berlin, is pictured signaling a pleasure craft to stop. On his feet are metal paddles for "walking."

Herr Hammer, water traffic cop, shown at work.

Human Wings Are Predicted

HUMAN wings are predicted by Dr. Lucien Bull, a director of the Marie Institute at Paris, who seriously advanced his theories before groups of American scientists. Dr. Bull believes the human wings will come as a perfectly natural and logical development and saw nothing in his startling claims to arouse surprise. "A man who is able to run upstairs ought to be able to fly," he maintains. "All that is necessary is to adapt ourselves to the air. I don't mean to say there are no problems to be overcome. There are many of them. But I am convinced the development of light, strong, metal-like magnesium aluminum will continue until some alloy is perfected from which human wings weighing about a pound can be fashioned." Dr. Bull is of the belief that the human wings should be about eight feet long and three feet wide. He pointed out that it would be a real convenience to be able to fly to work each morning instead of riding in crowded trolley cars or automobiles.

Model of Home Under Construction Shown on Grounds

Complete in detail, a model of a home under construction is shown in the foreground on part of the grounds of the actual house so that the owner may better visualize the structure when completed.

SEE how your home is going to look when it is completed. This innovation has just been introduced in fashionable Beverly Hills, near Los Angeles, Calif., by John S. Butler and Wayne R. Butler, architects, who erected a small model, complete in every detail, on the site of a new residence they are building. In addition to showing the house as it will look when completed, the model allows the working out of landscaping problems in advance detail. The picture indicates how the model has been erected.

Shot Gun Shell Self Starter for Airplane Engines Is Proven Successful

A SELF starter for airplane engines which uses half length twelve gauge shot gun shells to supply starting force is sponsored by Charles Levine, first trans-Atlantic air passenger, who is shown beside his ship, the *Columbia*, to which the device is attached. The starter in use on different types of motors hasn't failed to start the engine the first time. The four-pound device is screwed into the aperture of a cylinder from which the spark plug has been removed. The plug is then placed in the starter so that it continues to operate.

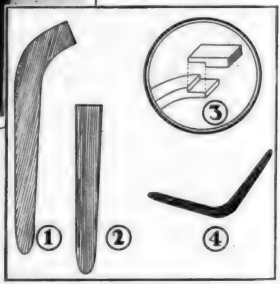
Levine is shown above inserting shotgun shell in self starter.

BOOMERANG Throwers

Deadly primitive weapon, a flat crooked stick, is still thrown by native tribesmen with remarkable accuracy and properly hurled the weapon will fly back almost to the feet of the thrower. Bushmen make more than 20 forms of boomerangs and the home shop worker can with little difficulty construct his own weapon.

by SAM BROWN

For throwing, the boomerang is held with the rounded side inward and is gripped firmly at one extremity as shown above.



In making a boomerang cut wood strips as shown in figures 1 and 2; fasten the pieces together with a lap joint as in figure 3, and shave and sandpaper to get the finished figure 4.

AGES ago, when life on earth was a thing of elemental strife, one of primitive man's first weapons was a stick. From the humble cudgel he evolved other weapons. By lashing the opposite ends of the stick together with gut, he fashioned a bow; by tipping the point with a sharp piece of flint, he made a spear; by bending the stick at an obtuse angle, he created the *boomerang*.

It was a strange weapon, this boomerang, and a deadly one in the hands of one accustomed to its erratic moods. With the flat, crooked stick, primitive man could bring low the fleet-footed antelope; he could let fly at birds on the wing with full confidence that his magic stick would find a mark. Occasionally he missed, and when this happened the stick rose like a vulture in flight to the height of about one hundred feet, and then, wheeling, it would hurtle back to the thrower, landing almost at his feet.

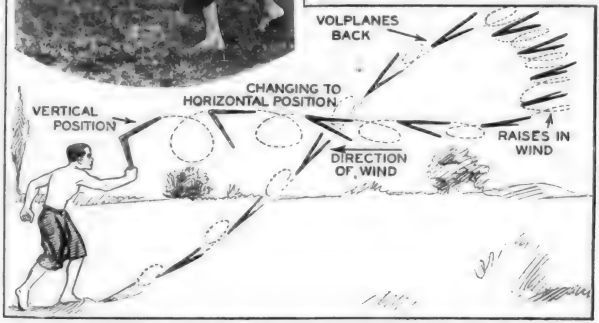
The present generation finds people in various parts of the world retaining the boomerang as a weapon, both for defense and for the hunt. In Australia, especially, where the flat, plain-like country makes an ideal arena for their manipulation, boomerangs abound. Many native tribes depend on them almost entirely. The little brown Bushmen of the Arunta tribe manufacture

Show AMAZING SKILL

no less than twenty forms of boomerangs, ranging all the way from a fourteen inch bird stick to the heavy, four foot war boomerang.

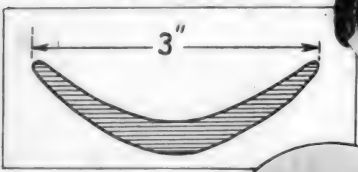
The average boomerang as used by the Australians is in the shape of an obtuse triangle, flat on one side and convex on the other, measuring about two and one-half feet from tip to tip. The brown men use acacia wood in their construction; yours can be fashioned from a piece of straight-grained and well-seasoned hickory or ash, about 2 feet long by 5 inches wide and 3/8 inches thick. From this board cut out

The illustration above shows the proper position for accurate throwing of the boomerang, curved edge inward, one extremity grasped firmly and swung back for a powerful throw which is just being completed in the left picture. The weapon is thrown away with a straight overhand jerk of the arm, spinning rapidly. Steady practice develops a well timed swing which gives the missile terrific force.



The boomerang is invariably thrown against the wind. Although leaving the thrower's hand in an almost vertical plane as pictured above, it gradually changes to approximately horizontal, then swerving to the left, it soars skyward and then volplanes back to the ground again landing virtually at the thrower's feet.

Paper boomerangs can be snapped into the air to return gracefully to operator.



This crescent shape, three inches long, is correct for making of cardboard boomerangs.

a piece of the shape shown in figure 1. This is, roughly, 19 inches long from the tip to the center of the bend, and tapers from 2¼ inches wide at the center to 1¾ inches at the end. Cut a second piece like that shown in figure 2. Fasten the two pieces together with a lap joint, as shown in figure 3, using plenty of good glue and two or three small brads.

In nailing the two pieces together, you must confine yourself to a narrow strip down the center, so that the brads will not interfere with the final step in making the boomerang. This consists in rounding one of the sides. Do this with a sharp knife or spoke shave, keeping the center portion of the boomerang the original ⅜ inch thick, and shaving the edges down to about ⅛ inch thick.

After roughly fashioning this convex surface with your knife, take a rough grade sandpaper and finish the job. Once the wood has been smoothed to your satisfaction, insert the final brads in the joint and give the whole thing a coat of varnish. Your finished boomerang should look like figure 4.

In throwing the boomerang, the missile is held with the rounded side inwards—to the left side of a right hand thrower. It is gripped firmly at one extremity and thrown away with a straight overhand jerk of the arm, spinning so rapidly that it is practically reduced to a circular plate of wood of a diameter equal to a line joining the two ends.

The cardboard boomerang is balanced on the forefinger of one hand as shown above and snapped with the forefinger of the other hand.

Skimming swiftly to the point of object and meeting no obstacle, it will rise like a bird seeking a place to alight, until it has risen a hundred feet or more, and then, wavering for a moment, it will turn and come swooping back toward the thrower.

The boomerang is invariably thrown against the wind. It is against the wind only that the magic stick is self-retrieving.

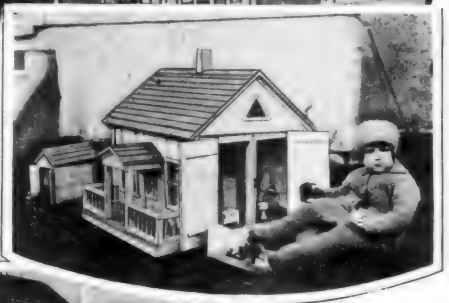
The parabolic flight of the boomerang is a beautiful thing to witness. Although the stick leaves the thrower's hand in an almost vertical plane, it gradually changes to approximately horizontal, then swerving to the left, it soars skyward and then volplanes back to the ground again.

Some idea of the flight on a Lilliputian scale can be gained by sailing a midget model. Make this from a piece of very stiff paper or thin card, about 3 inches long and crescent shaped. In propelling this tiny boomerang, it is balanced on the extended left forefinger and snapped with the forefinger of the right hand.

Amateur Mechanic Fashions Toy Bungalow from Scraps

USING simple hand tools and scrap materials, an amateur mechanic of Washington, D. C., has built a charming five-room bungalow doll house for his little daughter. It is a practical toy which would cost about $25 if purchased and equipped in a toy shop. There is a garage for the house and electric lighting throughout is arranged with extension cord and Christmas tree bulbs. Construction required 50 hours.

A fond father is shown at work here with scraps in construction of a five room doll house. The frame is made of white pine scraps which were used to protect a window sash in transit. The windows are fitted with small sash and glass. There is a well planned front porch and a garage designed to house a toy automobile. Hinged doors at the sides provide access to the inside.



A happy child moving furniture into her new doll house.

The completed doll house made of scraps is shown above. The house is easily portable as it is built on rollers. Double hinged doors on each side give access to the rooms. The walls are covered with white blotting paper to resemble plaster. The child has just completed arranging curtains at the various windows in the five rooms and is now ready to introduce her dolls to their new home. There is a removable roof shingled with composition shingles three inches square, cut from junk from a wrecked house. A colored roof effect can also be secured with use of various cardboards cut into shingles.

World's Most Unusual House Built in Form of Elephant

There are six rooms and 22 windows in this unique house built in 1882.

THIS structure built in 1882 and now on exhibit at Margate City, N. J., is claimed to be the most unique house in the world, being built in the form of an elephant and providing four bedrooms, a kitchen and a reception room as well as an observatory on the "animal's" back. Twenty-two windows furnish light and ventilation. The body is 38 feet long, and 80 feet in circumference; the head is 26 feet long, and 58 feet in circumference. More than a million pieces of timber were used in the construction, 200 kegs of nails, four tons of bolts and bars and 12,000 square feet of tin. The ears are 17 feet long and 10 feet wide, each weighing a ton. The tail is 26 feet long, the trunk 36 feet long, and the tusks 22 feet. The legs are 22 feet long, and 10 feet in diameter. The eyes are 18 inches in diameter and are made of glass.

Airplane Television Foreseen

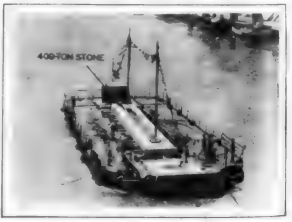
"MY CONTEMPLATED experiments this fall with television from an airplane, are now in process of apparatus assembly," states C. Francis Jenkins, television and motion picture pioneer. "I have bought a Stinson 4-place cabin plane with Wright Whirlwind 225 h.p. motor. In the floor of this plane we shall put a large lens, the image of which will be scanned by a rotating lens disc, which will translate the image of the ground viewed into electrical values which in turn will be flashed to a ground station. This apparatus has been tried out on the ground. While I have not actually done this thing, I have hopes of doing so, as the substitution of the airplane for the successful ground station does not seem to be an insurmountable attainment."

Sport Arenas Condition Air

THE nation's big sport arenas are following the lead of theaters in artificial cooling and controlled ventilation. One of the most recent of the huge sport arena enterprises to provide air conditioning during the hot weather, particularly, is the Chicago Stadium. More than 600,000 cubic feet of washed, conditioned air are delivered each minute into the immense inclosure of this building. The air conditioning system draws air from out of doors into large spray chambers wherein it is washed and completely freed from all dust and contamination which aerologists now call "air sewage." Within this system also the temperature and humidity are automatically adjusted to produce the conditions of maximum comfort within the stadium.

Largest Single Stone Ever Quarried at Carrara Is Moved by a Barge

A SPECIALLY constructed barge is shown here towing a 400-ton slab of marble from the famous Carrara quarries up the Tiber river to Rome. The great marble monolith, the largest single stone ever quarried at Carrara, which was started on its journey up the Tiber some months ago, recently arrived at Rome where it is to become a monument to Premier Mussolini of Italy. A special road was constructed from the quarries to the banks of the Tiber and 24 pairs of oxen were required to draw it on the first part of the journey.



Rugs Designed for Quoit or Golf Poker Games Indoors

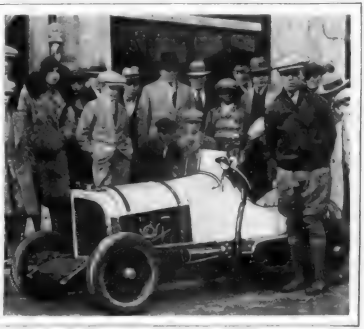
In the background is a rug for croquet while in the foreground are rugs with card symbols for the playing of quoit or golf poker or other games which may be devised by the players.

NOVEL rugs designed to permit the playing of various games are now on the market. The rug pattern is an arrangement of card symbols and numbers. Quoit players toss for the Joker first and then make out a poker hand with four more quoits. Golfers use a putting disc and upon their accuracy depends the kind of a poker hand they draw in the carpet game. The game rugs assist in developing the skill of the golfer and players must be very adroit to put up a good game. Another rug is used for croquet and sometimes the croquet wickets are used in the golf poker game to increase the hazards. Owners of these rugs have found that it is possible to arrange a number of different games to be played thereon. One difficult hazard may be added by placing some small object under the rug or permitting a wrinkle.

Tiny Car Develops 67 Miles Per Hour With Low Fuel Consumption

UNDISMAYED by present-day parking and traffic difficulties in large cities Philip Giordano set out to build a car which is handy in traffic, "turns on a dime," and is easy to park, requiring a very small section of the curb. His car is 6 feet long and half as high. It can go 67 miles per hour and travel 40 miles on a gallon of gasoline. The car is quick on the pick-up and can turn around completely in a circle with a diameter of but 10 feet. The car has attracted considerable attention, drawing a crowd wherever it is parked.

In this light, fast car with small turning radius Giordano is able to weave in and out of the most difficult traffic with ease and dispatch, eluding trucks and taxicabs.



Philip Giordano's midget car shown above beats traffic jams.

"Tele-Talkies" in Color

A VERY pretty girl in a fancy dress of many colors sat before a transmitter in a certain section of the Bell Telephone Laboratories in New York City the other day. Just a few steps away, in an adjacent room, a group of famous scientists and journalists, evincing the utmost curiosity, concentrated their attention upon a television receiving apparatus.

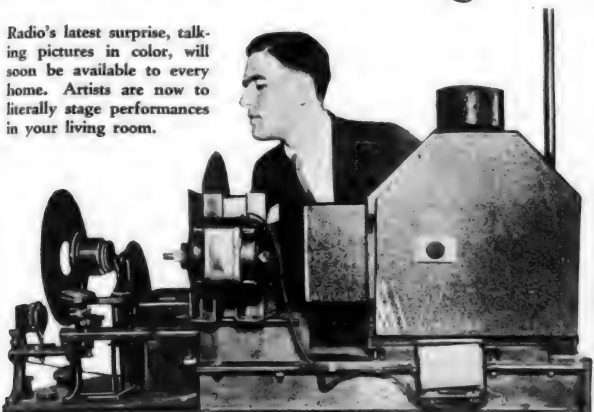
Their interest was soon rewarded. Sweeping across a large magnifying lens, connected with one of the most modern types of

Leila Hyams, picture star, receives televised Stanford football game.

C. Francis Jenkins, father of television, receiving one of his own broadcast television programs.

Latest Feat in RADIO

Radio's latest surprise, talking pictures in color, will soon be available to every home. Artists are now to literally stage performances in your living room.



This is the Baird television sending apparatus for putting movies on the air. The all-important scanning disc extends from the machine near the man's shoulder. Note condenser at extreme left.

radiovisor, could be plainly seen the dress, features and form of the charming girl, in the original colors!

Here was an accomplishment indeed. Not only did it mark the first time movies in full color had been broadcast successfully in this country, but it gave promise of a time not remote when Mr. Average American, seated before an inexpensive radio set, will be able to view world events, thousands of miles away, in all their colorful majesty.

This triumph of television research is only one of the many introduced to an astonished America during the past few months. The famous British radio inventor, John L. Baird, has just opened an office in New York, where his American representative, Captain W. J. Jerrard, plans to introduce something entirely unique to Yankee television enthusiasts which he refers to as the "tele-talkie." Meanwhile, C. Francis Jenkins of Washington, D. C., world-noted pioneer in radiomovies, has lately made three outstanding contributions to the new science: a quartz rod drum to take the place of the customary scanning disc used in television transmitting; a novel television camera making it possible to accomplish airplane broadcasts; and a unique system of transmitting, as a regular procedure, movies that in appearance are not so remote from those we now see in the average motion picture theatre.

Color tele-movies is the achievement of Dr. Herbert E. Ives of the Bell interests. A point he likes to stress about his invention is that it does not require entirely new apparatus—it utilizes the same light sources —scanning discs, synchronizing systems, etc.—and the same type of circuit and method of amplification as are used in the monochromatic method. However, Dr. Ives explains that there are needed a different type and arrangement of the photo-electric cells at the sending end, as well as of the neon and argon lamps at the receiving end.

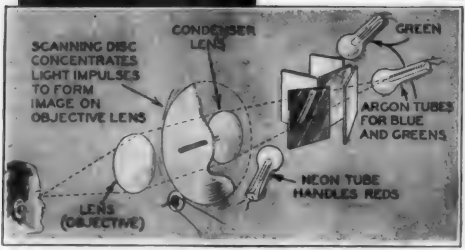
Dr. Ives points out that for the ordinary human eye any color may be repre-

Foto-phone shows whom you are talking to!

sented by the proper mixture of red, green and blue—the three fundamental colors. In order to mix these colors effectively a method has been used known as "beam scanning." Explains Dr. Ives:

"To apply this method to color television, three sets of photo-electric cells are employed in place of the one set used before. Each of these sets is provided with color filters made up of sheets of colored gelatin. One set has filters of an orange-red color which makes the cells see things as the hypothetical red sensitive nerves of the retina see them; another set has yellow-green filters to give the green signal, and the third set has greenish-blue filters which perform a corresponding function for the blue constituent of vision.

"The scanning disc and the light source are the same as with the beam scanning arrangement used in monochromatic television. The



Television in color is explained by this diagram for a color receiving set.

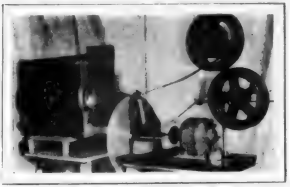
Above is shown the other end of the foto-phone, which carries the picture of the man who is telephoning to the girl in the booth above. In turn her picture is clearly visible to the man she is talking with. This is a recent German invention.

only difference is in the photo-electric cells, and thanks to the tri-chromatic nature of color vision, it is only necessary to have three times the number of cells used previously to reproduce all colors. Three sets of television signals, one for each set of cells, are generated instead of one, and three channels are used for the transmission of the television signals. In the new photo-electric cell container, twenty-four cells are employed, two with "blue" filters, eight with "green" filters and fourteen with "red" filters. Large sheets of rough-pressed glass are set up some distance in front of the cell containers, so that the light reflected from the subject is well diffused.

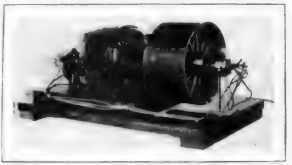
"For color television the images must be received in their appropriate colors and viewed simultaneously, this reception being similar essentially to our method of monochromatic television. The surface of a disc similar to that used at the sending end is viewed, and the light from the receiving lamp is focussed on the pupil of the observer's eye by suitable lenses. To combine the light of the three lamps, they are placed at some distance behind the scanning disc and two semi-transparent mirrors are set up at right angles to each other, but each at 45° to the line of sight. One lamp is then viewed directly through both mirrors and one lamp is seen by reflection from each (see diagram).

"The receiving apparatus at present consists of one of the 16-inch television discs used in our earlier experimental work. Behind it are three special lamps (able to work at high current densities), and a lens system which focusses the light into a small aperture in front of the disc. The observer looking into this aperture receives, through each hole of the disc as it passes by, light from the three lamps—each controlled by its appropriate signal from the sending end. When the intensities of the three images are properly adjusted he therefore sees an image in its true colors and with the general appearance of a colored motion picture."

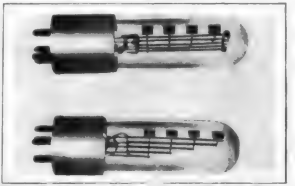
The "tele-talkie" of John L. Baird seems to rightfully deserve its unique title, for it consists of simultaneous broadcasts, on the same wave length, of the voices and images of living entertainers. This is being done, Captain W. J. Jerrard, Baird's spokesman, explains, "on the present wave length facilities of stations and without disturbing their present apparatus, just as it is sent over ordinary radio broadcasting wave lengths.



One of the first forms of Jenkins transmitters for sending movies via radio.



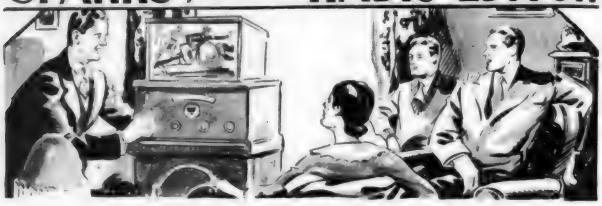
This is the machine which does away with the scanning disc. Light is carried by quartz rods which break light into beams.



The nodes of these Jenkins radiovisor lamps send individual beams through the quartz drum.

This is a home made receiver made from Jenkins Kit parts by an amateur television enthusiast.

SPARKS *from the* RADIO EDITOR



Edited by L. B. ROBBINS

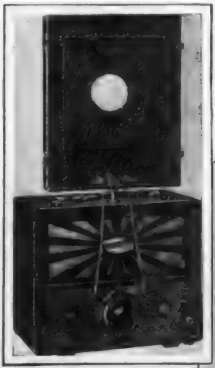
Mr. Robbins is nationally known as an authority on radio short cuts and kinks which help the radio fan to save money and perform interesting experiments. Mr. Robbins has operated amateur radio station W1AFQ for several years.

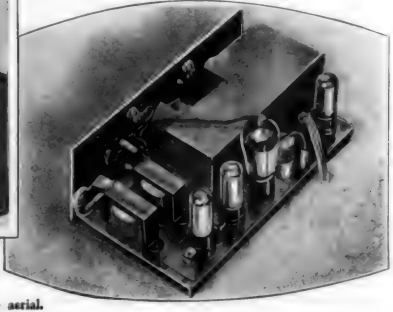
New Travel-R Sets Last Word in Portability

FOR the camper, the sportsman and the traveler who wants radio entertainment in the hotel room a midwestern manufacturer has lately put on the market a new set having the modern single dial tuning, loop aerial and self-contained battery which makes the set the latest word in portable radio sets.

There are two stages of radio frequency amplification and one of audio frequency. Operating on its own batteries the set is able to pick up entertainments from any place in the United States. It is reported as having enjoyed a wide sale at its recent debut in the Radio Show.

The use of such sets, spreading to all classes of people who travel, has opened up for the manufacturers of radio a new market. The set is said to sell for around a hundred dollars.





Something of an innovation is this set for travelers which contains its own battery power source and which is equipped with a leather covered flat loop aerial.

Device for Testing Distilled Battery Water Tells Purity

Impure battery water is often the cause of poor reception and tends to deteriorate the battery quickly. Here is a method for checking the purity of distilled water. Place a doorbell battery and a high resistance milliammeter in series. If a current passed through the water reads over 1 milliamp, throw the water out. This is the simplest known method of testing.

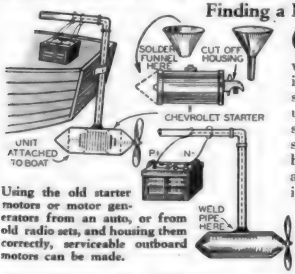
DESPITE the fact the distilled water comes in sealed carboys, it often becomes contaminated after being opened so that it is unfit for storage battery purposes. Rainwater, which is sometimes used as a substitute, also has the faculty for being impure, even though it may be collected and held in the cleanest possible manner.

If you are the careful man you will want to feel sure the battery water is of the best quality. A simple test can be made right at home that will give an excellent check on the quality of the water and it takes only a few moments to make it.

Place the water to be tested in a glass or earthen dish. Then place a common 1½-volt doorbell battery and a high resistance milliammeter about 0 - 5, in series with the water and battery completing the circuit by lowering the two open wires in the water a few inches apart. This is clearly shown in the photograph.

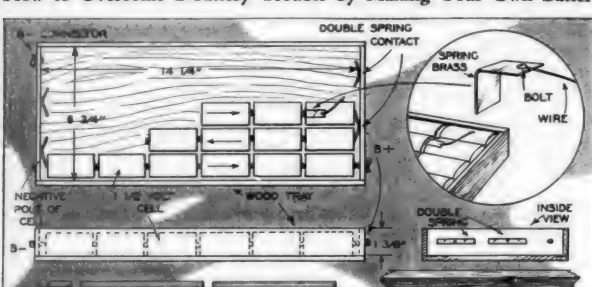
Finding a New Use for Old Motor Generators

OPERATORS of amateur radio stations sometimes have old motor generators which can be used for "jury service" in an interesting experiment. A number such I have seen used on rowboats as outboard motors, usually hooked to a multiple 60-100 amp/hr storage battery. Old auto starter motors will serve as well. The housing is made watertight by soldering the closed ends of funnels over, after properly servicing and oiling the bearings. A tiller is made from pipe and a tacked weld made to the jacket at a point where the heat cannot hurt the winding. A small propeller of sheet metal will complete the unit.



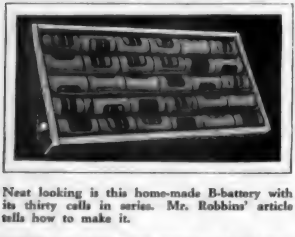
Using the old starter motors or motor generators from an auto, or from old radio sets, and housing them correctly, serviceable outboard motors can be made.

How to Overcome B-battery Trouble by Making Your Own Battery



Individual cells in commercial B-batteries often are eaten through before the other cells have served their useful life. This incapacitates the entire battery. Here is a unit you can make, which has long life.

WHEN one or two cells in a block B-battery eat through their zinc jackets they short circuit the rest and ruin the block. By making your own B-batteries you can overcome this trouble and not only lengthen the life of the battery but reduce expense. The rechargable units shown in the photographs were built by the editor of this department and have proven every claim. Each unit gives 45 volts and they can be piled up in a smaller space than can 45



Neat looking is this home-made B-battery with its thirty cells in series. Mr. Robbins' article tells how to make it.

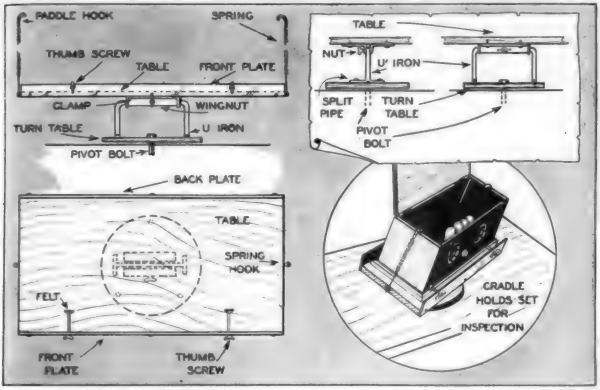
volt blocks of the same capacity of the commercial type of B-battery.

Each unit consists of a wooden tray 14½ inches long, 6¾ inches wide and 1⅜ inches deep—inside measurements. Shellac inside and out and then cut out four pieces of spring brass 1¾ inches long by ½ inch wide and drill holes in their centers. Starting at the upper inside left hand corner, with the tray horizontal, bolt a spring clip binding post on the outside of the tray so the bolt head is inside and at a point that will make contact with the middle brass terminal of a flashlight cell measuring 2 5/16 in. long by 1¾ in. in diameter. The tray will just hold five rows of six cells each when laid end to end as shown. The direction of each row is reversed and the end cells bear against the ends of the four flat springs just described and the zinc of the last cell in the fifth row bears against the bolt head of a second spring clip binding post as indicated.

One terminal clip is positive and the other negative and should be so marked according to whether brass or zinc of connecting cell makes contact.

With 30 cells in the tray a voltmeter reading from one terminal to the other should read 45 volts. If it does not, make sure all cells make positive contact. Then bend a piece of brass at right angles and fasten a lead wire to one end. This brass can then be inserted between the fifteenth and sixteenth cells for the detector tube voltage of 22½ volts if desired.

Servicing Cradle for Radio Sets Saves Hours of Time in Repairing



Here's an indispensable servicing bench upon which a set can be mounted for easy demountability.

EVERY serviceman and every active set builder knows just how awkward and unhandy it is to work on a set in the ordinary way. For testing and adjusting certain parts the cabinet or chassis has to be tilted one way and another for best operation. To lessen such labors and make servicing a real pleasure instead of a job an adjustable cradle as shown in the accompanying diagram is practically a necessity.

The table consists of a smooth, heavy board somewhat longer and wider than the average sized receiver. On the front and back edges screw a heavy metal plate about an inch higher than the table top. In the front one drill and tap two holes to take a pair of thumb screws and swivel faces. Pad the latter with felt to save scratching the front panel of the set.

Putting Screws in Tight Places

HOW many times have you tried to replace a bolt or screw in a place between two pieces of apparatus or in some cranny too small for the fingers to be inserted? Here is a simple way to do it.

Get a small lump of soft wax and press a small bit on the screw or bolt head. Push the screwdriver vertically into the lump of wax and the bolt or screw can then be lifted and dropped down into the threaded hole and started easily.

Wax is used to set screws into difficult places.

Miniature HOUSES

Artists specialize in making model homes from architects' drawings, using cardboard and coating entire structure with plaster of paris before coloring. Builders can thus make alterations quite cheaply.

Al Allard, art director of Modern Mechanics, is shown using sealing wax to plug cracks in the cardboard model of an English country house, the model being in the first stages of construction.

YOU see them every now and then in the windows of department stores or in architects' offices, or in the displays staged by real estate developers—those miniature model homes, so carefully constructed and beautifully painted. Perhaps you've wondered about them. Who makes them? How are they made?

If you have seen these miniatures and wondered about them, here are the answers to these questions. The model homes are usually made by artists who specialize in this sort of work. They are made directly from architects' drawings in close cooperation with the architects and they are made exactly to scale.

In some cases the roofs are made so that they can be removed and in such cases the interiors of the buildings are completed just as they would actually be when constructed.

By showing homes and other buildings in miniature to prospective buyers, the architects and contractors find it much easier to put their sales arguments across. So the models are in reality excellent sales builders.

By having everything visualized in this manner it is possible for owners to indicate desired changes before the actual construction work starts, thus saving much money. For instance, just recently a Los Angeles man was having a $175,000 home built. Carefully studying the model of the home before work on it was started, he found several changes which he desired to have made. It was easy enough to make the changes in the miniature at practically no expense to the owner.

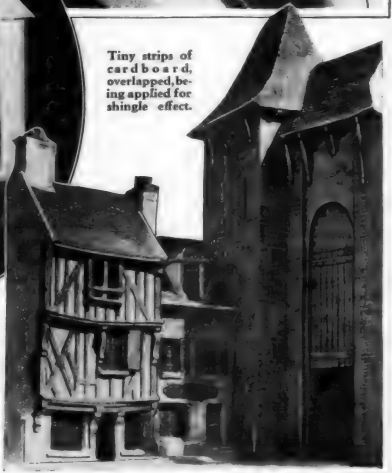
If these changes had been made after construction had been started on the building, the alterations would have cost him nearly $25,000. Of course, on larger business structures the amounts saved in this manner are even greater.

Miniatures have also been found an invaluable asset to technical directors in the large motion picture studios. When a picture scenario is finished, a copy is turned over to the art director whose duty it is to work out in minute detail all the settings and properties called for in the script. Not only are the miniature settings an asset to the carpenters and other craftsmen but they enable the director to plan out camera

MADE from PAPER

Tiny strips of cardboard, overlapped, being applied for shingle effect.

The model home is shown above ready for coloring. All of the cardboard has been covered with a thin coating of plaster of paris which, when dry, makes the model look as though it were actually carved out of clay. Water colors are used for tinting. They are absorbed by the plaster and when dry give the model a somewhat weathered appearance. Isinglass is glued behind the windows as an imitation of glass.



The completed model with red tile roof is shown above.

angles and action before the large sets are actually built. This eliminates much expense and time, thereby holding down production costs of the photoplay.

It is easy to see how essential a working model is to architects, contractors and motion picture technicians and it is not surprising that with the growing demand for these little miniatures, a specialist in this line can earn from $50.00 for the smallest kind of model to hundreds of dollars for the larger ones.

Many models are carved or molded from clay and plaster. The need of molds and carving tools make this method of miniature reproduction very costly and months of hard

Artists Specialize in Construction of These Charming Cardboard Houses

Alfred Weidler, Los Angeles artist, who has specialized in model production for the past four years, is shown at work in his studio.

A close-up of one of Weidler's home models.

labor are necessary. Some models constructed in this medium have taken from one to two years to build and then only a highly trained artist could make them properly.

Think of the time thus spent on plaster models as compared to the new method of creating them out of cardboard scraps and glue.

Usually it takes from three days to three weeks to build a model of cardboard and paper. The materials used include wallboard, cardboard, paper, isinglass and plaster of paris. Because of the inexpensive materials used, the cost amounts to practically nothing.

Suppose you desire to reproduce in miniature a small English country house. First a working design should be sketched on paper. This should show the front, side and back elevations. You then transfer these sketches to the cardboard which is cut out and joined together with tiny flaps of cardboard and glue. Windows and doors are cut into the walls and strips of wallboard added around the inside edges to give the necessary thickness to the walls. The roof is next added and strips of shingles laid on, very much after the manner of shingles on a real home.

Then comes the work of putting on the exterior effects so essential to the English design of home. Tiny bits of cardboard give the illusion of bricks, while thicker strips in proper design give the effect of half-timbering. Isinglass glued behind the windows makes an excellent imitation of glass.

The house is mounted on a ground board over which a fine coating of sawdust has been glued. Tinted green this will look like grass.

Shrubbery made from steel wool or small sponges is added around the base of the building and a tiny sidewalk built of cardboard flagstones laid across the lawn.

Now comes the work of painting or tinting the miniature. Before the colors are added it is necessary to cover all of the cardboard with a thin coating of plaster of paris. When dry, this makes the model look as though it were actually carved out of clay.

Ordinary transparent water colors are used for the tinting. Brushed on deftly in watery form, they are absorbed by the plaster and when dry give the effect of building materials that have been slightly

aged by weather. The grass and shrubbery are then dyed an olive green color and the miniature English country home is ready for display.

To the art director of a motion picture falls the difficult task of converting the setting and atmosphere of a story into concrete form and frequently to get the best results he calls on the model specialist. A desolate New England countryside formed the background of many sequences in a Frank Borzage production and several possible locales were considered before it was decided to erect the set on a 150 by 300-foot stage.

An indoor stage proves an advantage as every object may be chosen to emphasize atmosphere, every tree and fence post may add to the character of the background, and its obvious effect

This model New England countryside was worked out in detail before the full sized set was constructed for filming of a motion picture.

This full sized motion picture set was copied in every detail from the model shown above it in the countryside model.

upon the people in the story. Nature furnishes many effective backgrounds, but she is apt to throw into relief objects which have no bearing on the plot. For this reason only familiar objects are used by the art director. All this must be taken into consideration by the model artist before he begins work. The decision on an indoor set having been reached, Harry Oliver, art director for Fox Film Corporation for the film to be made, fashioned a model, every detail worked out to scale. In planning the scale Mr. Oliver took into consideration that the rear of the platform on which the set is erected is 20 feet higher than the front. He had to plan for hills and meadows of sand and real sod, trees and other foliage.

In the finished set some real trees were used, or plaster molded over smooth trunks. Birch trees were made from sycamore and poplar trunks covered with white bond paper and painted to simulate the markings of the birch. The paper was put on in sections and made to curl as does birch bark.

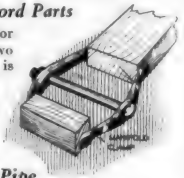
HANDIKINKS

Short cuts in doing everyday tasks—novel methods of using waste products for useful purposes—all these "handikinks" appear regularly in this department each month.

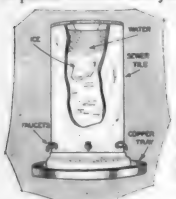
Oil Barrel Punched Full of Holes Makes Efficient Back Yard Incinerator

MOST householders have a spot in the back yard where they build a bonfire now and then for the purpose of burning up waste paper and other refuse. In case there is a breeze blowing, however, this arrangement is not so satisfactory, since sparks and cinders are likely to be carried over the neighbor's fence and harsh words sometimes ensue. Find yourself an old steel barrel and build a back yard incinerator in which to consume refuse. Punch the sides of the barrel full of holes, as shown in the drawing at the left. This permits the entrance of air and sets up a strong draft.—Claude H. Cook.

Wood Clamps From Old Ford Parts



FREQUENTLY the need arises in the woodworking shop for an extra clamp needed on an emergency piece of work. Two old Ford manifold clamps can be used as shown at right. A bolt is run through with a nut for tightening. The work to be clamped is placed between two jaws of the clamps, while a block of wood is inserted between the other jaws—an excellent clamp resulting. —Frank Bentley, Jr.



Drinking Fountain from Tile Pipe

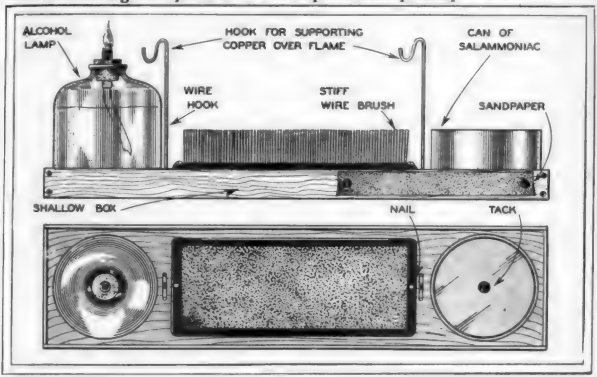
AN INEXPENSIVE drinking fountain can be made from a piece of tile pipe such as is used in constructing sewers. The drawing at the left shows how a length of pipe is upended on a copper tray and faucets inserted near the bottom. A wooden cover protects the contents from the air. The pipe is filled with water and ice is added.—Russell Raymond Voorhees.

Preserving Key Forms

WHEN a key is lost there is often considerable difficulty in replacing it. As safety insurance against such a predicament, trace the outlines of your keys on a sheet of paper and cut out the forms with a pair of scissors. The result will look like the patterns in the drawing at right. Duplicate keys can easily be made from the patterns.—Mildred Cass.

Stunts for the Home Workshop

Neat Soldering Kit for Use With Spirits Lamp Keeps Tools in Place



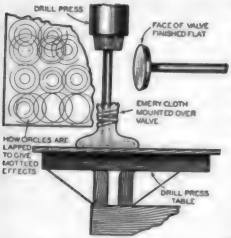
MOST soldering today is done by the amateur with an electric soldering iron. The worker who has to get along with the flame heated iron is really out of luck, but his work can be systematized and made easier by using a little kit like that shown in the sketch. The writer is of the latter class and has used a kit, similar to the one shown, to good advantage.

The base consists of a little shallow wooden box made to hold the accessories shown. An alcohol lamp sits at the left end, to the right of which is an upright wire bent in a hook at the top to hold the shank of the iron just above the lamp flame. To the right of that is fitted a stiff wire brush. This is screwed to the bottom of the box. Then comes a second vertical rod to hold the handle of the iron and then against the right end of the box is placed a tin of sal-ammoniac. A strip of sandpaper on the outside edge of the box is used as a match scratcher. A coil of rosin core solder is slipped down over one of the rods when the kit is idle. The brush is used to clean the iron of loose solder and dirt and the sal-ammoniac is used to clean and brighten the iron before heating.—L. B. Robbins.

Handy Tool Case Housed in Sawhorse

TRAVELING handy men will appreciate the combination tool case and sawhorse shown in the drawing at the left. Such an article of furniture will also be a welcome addition to the home workshop. The sawhorse follows conventional design except that its dimensions are considerably smaller than ordinary, making it of such a size that it can easily be carried about. The tool case compartment occupies the center of the sawhorse. One side is hinged to act as a doorway and a hasp is run through the top piece to allow for installation of a padlock. Use hardwood in constructing the sawhorse, which should be sandpapered and varnished to present a neat appearance.—Theodore Allen.

Items to Interest the Home Mechanic

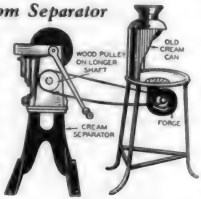


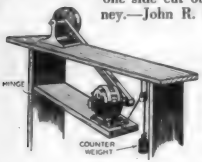
Mottled Metal Finish Done With Valve

METHODS of obtaining the mottled finish which adds so appreciably to the aluminum parts of airplanes are little known outside of large machine shops. To produce this finish ordinary engine valves are adapted to the purpose. These valves are finished flat on top and a piece of emery cloth is folded over the head and secured with a rubber band. The valve is then rotated in a drill press against the surface of the metal to be mottled. Note drawing.—G. A. Luers.

Forge Blower From Separator

A DISCARDED cream separator makes a good operating unit for a forge when connected up as shown in the drawing at right. The separator to be used, of course, is one which is no longer fit to serve its original purpose. A wooden pulley is attached to the separator as shown and a belt run between it and the forge so that a few turns of the handle set up a brisk draft. An old cream can with one side cut out forms a hood and chimney.—John R. Naaz.



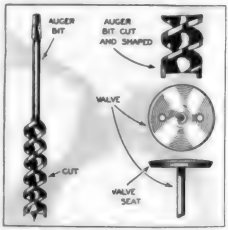


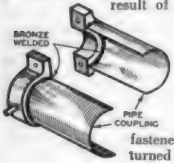
Motor Mounting Keeps Grinder Belt Tight

LEATHER belts for driving machinery often become loose from stretching. The scheme shown in the drawing at the left allows the weight of the motor driving a grinder to compensate for this stretching. The motor is mounted on a hinged board below the bench top. If the motor is too heavy, use a counterweight.—L. P. Young.

Auger Bit as Valve Grinding Tool

MOTORISTS who do their own valve grinding will appreciate this simple tool pictured at the right in which an auger bit has been converted to a new use. Cut the bit off as shown and shape the end of it so that two projections are left which will fit into the top of the valve. Then fit the brace handle to the bit, insert the tool in the valve, and the grinding operation can proceed easily. The workman will not tire easily when he uses this tool, with the natural result of a better job.—D. J. Hill.





Emergency Pulley

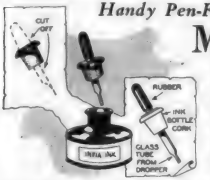
FREQUENTLY a small pulley is needed in a hurry. Take an ordinary split collar to fit the shaft on which the pulley is to be placed. Saw a pipe coupling. Bronze weld each half to the split collar as shown. Turn a piece of soft steel to the exact size of the shaft. The two halves of the collar coupling are fastened to this turned piece, after which any kind of face can be turned on the coupling.—W. T. Claytor, Jr.

New Wrinkles for the Handy Man

Concrete-Filled Tin Pans Make Exercising Dumb-Bells

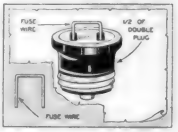
A GOOD set of dumb-bells is rather expensive, and many folks who would otherwise use them for exercising are deterred by the cost. It is not difficult to make a satisfactory set, however, using materials which will not cost more than a few cents. Two tin pans are obtained, of a size to suit, and filled with concrete to the desired weight. A metal pipe is then inserted in the two pans as shown in the drawing at the right. It is best to coat the pan first with a thin layer of oil or grease, and the ends of the pipe handle should be mushroomed out.—Geo. Thompson.

Handy Pen-Filler Is Ink Bottle Cork



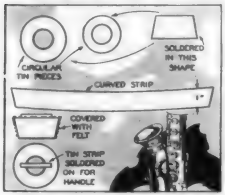
MUCH time is lost by draftsmen and others in filling drawing pens with the quill contained in the top of the conventional India ink bottle. A means of overcoming this nuisance is by the use of an eye-dropper inserted in the cork, as illustrated at left. Remove the composition top and quill and bore a hole slightly larger than the eye dropper. Cement in place with Plaster of Paris.—B. G. Switzer.

Making Emergency Fuse From Old Socket Plug



WHEN a fuse of the household lighting circuit "blows," you may remember that pennies placed in under the fuses will restore the connection and bring on the lights. This method, however, is dangerous. An emergency fuse can be made from half of a double plug. Take a bit of wire from an old fuse, shape it into a U, and attach it to the plug as shown. This fuse can easily be renewed.—Kenneth Bronaldo Murray.

Device Deadens Saxophone Vibration

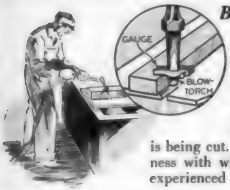


SAXOPHONISTS can soften the tone of their instruments with the simple device shown at left. Measure the diameter of the saxophone bell at two points five and six inches from its top and cut two circles of light tin to the diameter found. Solder these two disks to a curved side strip as shown. Bore a hole through the center of both disks and solder a tin handle on top of the device. Cover the whole device with felt and insert in bell.—B. Switzer.

Discarded Auto Seat Spring as Light Bulb Protector

LIGHT bulbs in the workshop or cellar are constantly being broken when loose ends of lumber are carelessly struck against them. A spring protector which will prevent the bulb from shattering can be made from an old auto seat cushion. Remove one of the coiled seat springs. Unscrew the bulb from its socket and place it inside the spring. When the bulb is screwed back in place the spring will be held securely and it will be practically impossible to break the light. This device can also be used on portable lights such as are used by mechanics.—A. Jeffers.

Hints for the Home Workshop

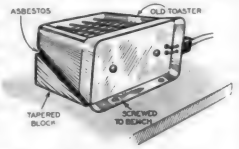


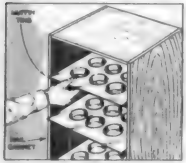
Blow-Pipe Guide Makes Saw-Like Cuts Possible

SHEET metal can be cut with a blow torch almost as sharply and thinly as if a saw were used with the aid of the simple gauge pictured at the left. The gauge fits around the end of the blowtorch so that one side is free to run along a block placed as shown. Distance between the tip of the torch and the metal is adjusted according to the thickness of the plate which is being cut. Sharpness of the cut will depend greatly on the steadiness with which the torch is moved. With this method any fairly experienced man can produce a narrow, sharp cut.—Fred Kautz.

Electric Toaster Keeps Glue Pot Warm

A PRACTICAL glue pot warmer for the home work shop can be made from an old open face electric toaster, as shown at right. The toaster is laid flat on a tapered wood block whose top side has been covered with asbestos or sheet metal. This arrangement leaves the top of the toaster horizontal with the table top to accommodate the glue pot.—Theodore Allen.



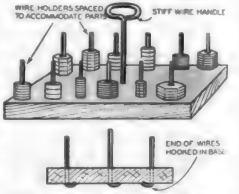


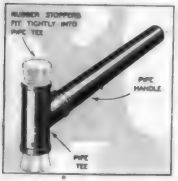
Muffin Tins Hold Nails in Handy Cabinet

NAILS, brads, screws, nuts and washers of various sizes are an essential part of the workshop equipment, but sometimes it is difficult to locate these small items unless you have some sort of storage system similar to that shown at the left. Secure several baking tins of the type shown at the ten-cent store. Obtain a wooden box from the corner grocery and nail cleats along the inside as drawer-rests for the tins. The drawers can be pulled out when needed.—T. S. Asgaard.

Shop Carrier for Washers and Nuts

A STOUT, flat board a foot or more in length makes a valuable carrier for washers and small parts which must be transported from one end of the shop to another. Stiff wires are mounted in the board at intervals, the under ends being hooked into the bottom of the board as shown. Washers and nuts are then dropped over their individual wires, which are spaced the proper distance apart. The carrying handle runs through the center of the board.—G. A. Luers.





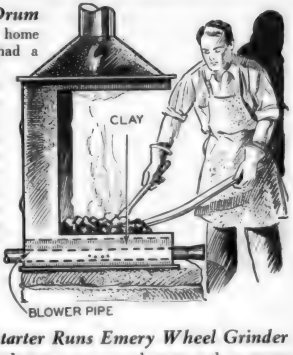
Soft-Nose Hammer Made From Rubber and Pipe

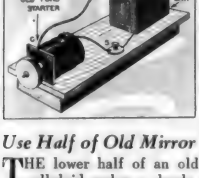
A SOFT nose hammer is useful in any workshop. It is hard to beat for smoothing out thin metal, and can be used on objects easily marred. From a plumbing shop get a piece of ¾-inch pipe 14 inches long, with one end threaded for a tee which is screwed on. Then from the drug store get two rubber stoppers which will make a tight fit in the ends of the tee and screw them into place. The threads in the tee will cut into the rubber so that after you have turned the stopper as far as it will go it is prevented from working loose.—D. VanHorn.

Things to Make from Discarded Articles

Efficient Forge Made From Old Oil Drum

EVERY man who works with metals in his home shop sooner or later wishes that he had a forge, but this piece of equipment is usually rather expensive. If you can get hold of an old steel oil drum, which can be purchased for a few cents at a junk shop, you can make yourself a forge as shown at the right. Cut the side from the drum and fit a hood over the top with a pipe to carry away the smoke. Construct a fire pit in the bottom from clay or concrete. The blower pipe runs through the fire bed. Several small holes are drilled in the pipe to give draft to the fire. The end of the pipe is plugged, the plug being removable so that the pipe can be blown clear of cinders. —A. C. Wilson.



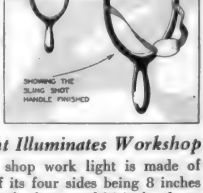


Old Ford Starter Runs Emery Wheel Grinder

ONE old Ford starter, a storage battery, and an emery wheel make a practical little grinder for the shop at almost no cost. Cut off the shaft of the starter after allowing for the thickness of the emery wheel and a pair of washers, for which the shaft should be threaded. Mount the wheel on the shaft and secure the unit to its board base or to the workbench. Wire as shown.—H. W. Moore.

Use Half of Old Mirror for Sling Shot Handle

THE lower half of an old mirror frame of wood or celluloid makes a dandy sling shot handle. Cut the frame as shown in the drawing at the right, and then trim down the ends to the thickness of a lead pencil where you are going to attach the rubber bands, leaving a rounded tip at the top so the band will not slip off easily. Place the ends of rubber around the handles and wrap them tightly with rubber bands, tucking the ends under the wound layers to prevent unwinding.—Walter Sehm.

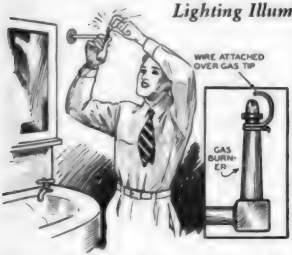


1000-W. Home Made Light Illuminates Workshop

THE reflector of this efficient shop work light is made of brightly polished tin, each of its four sides being 8 inches wide at the base, 12 inches wide at the front, and 14 inches long. Solder the seams and run a stiff wire around the front edge over which the tin is bent for added strength. Cut a block of wood as a base to support the socket. A 1000-watt bulb costs $6.50 and throws an intense light, but a 250 or 500-watt bulb will ordinarily be strong enough. To make the light nonglaring, mount a ground glass cover over the light, allowing at least one inch between glass and reflector for circulation of air. Tin strips crimped at the end and soldered to the reflector will hold the glass.—Lincoln Leach.

Simple Devices You Will Find Useful

Lighting Illuminating Gas Jet with Your Finger Tip

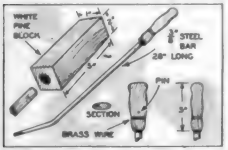


STATIC electricity can be brought into play to light the gas jet in the absence of matches, or simply as an interesting trick. Get a piece of fine iron wire and wind it around the tip of the gas burner, curving the end over as shown in the drawing to form a spark gap. Wait for a cold, brisk morning while wearing leather soled slippers or shoes and scuff around the room several times, preferably on a carpet or rug. Turn on the gas jet with one hand, which is gloved. Then instantly touch the twisted wire with a finger of your other hand; the gas will ignite from the spark.—L. B. Robbins.

Device Loosens Screw Caps on Jars and Cans

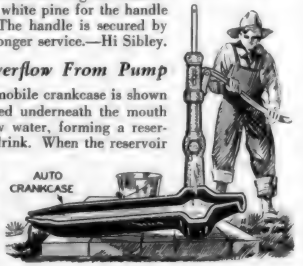
HOUSEWIVES will appreciate this handy little device for loosening the tops of tightly fastened screw caps on pickle jars and cans. Two pieces of wood, shaped as shown in the drawing at right, are fastened to any stout wooden facing with hinges. The can is inserted between the tips, which hold the cover immovable while it is being unscrewed. The harder the can is pressed against the wooden blocks, the more firmly the top is held.—Vernon V. Johnson.

Redwood Block Makes Neat Fireplace Poker



THE handy fireplace poker shown at left is constructed from a baby carriage axle and the end of a redwood fence post. Lacking an abandoned baby buggy, a half-inch iron bar will serve as well. Before carving the wood handle block to shape, bore the hole for the rod about 2½ inches deep. It should be a snug fit, but not so tight that the wood will split when forcing the rod in. Carving the handle is a job for jack-knife and chisel. Substitute white pine for the handle if you want a wood that is easily worked. The handle is secured by a pin run through the rod. Oil the wood for longer service.—Hi Sibley.

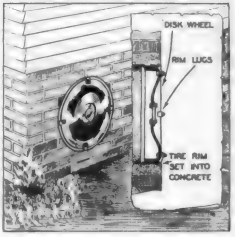
Automobile Crankcase Catches Overflow From Pump



AN INGENIOUS use for a discarded automobile crankcase is shown in the drawing at the right. It is placed underneath the mouth of a well pump where it catches all overflow water, forming a reservoir from which the chickens and birds can drink. When the reservoir overflows the water all falls on one side of the platform and prevents the ground on the operating side of the pump from becoming boggy. Another advantage of this simple stunt is that dripping water is caught in a metal basin and thus prevented from digging holes in the soft earth.—G. Mickelson.

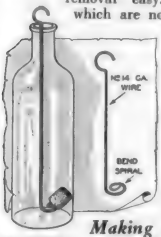
Ideas for the Home "Fix-It-Man"

Disk Wheel Makes Coal Chute Cover



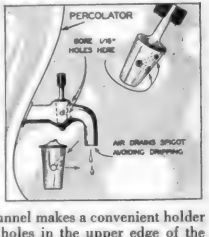
DISK wheels from an automobile can be utilized as coverings for wall openings, such as the coal chute shown in the drawing at right. In this instance the tire rim was imbedded in concrete and the wheel was used as a cover. The only change needed in the wheel was the placing of a small bolted plate over the opening for the hub. Lug-bolts and lugs can be used to make the cover non-removable from the outside. The wheel can be fitted with a handle to make removal easy. Obviously only wheels which are not fit for further car service will be used as covers.—G. A. Luers.

Wire Hook Recovers Cork from Inside of Bottle



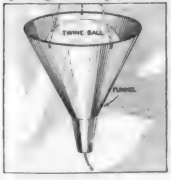
EVER have the experience of accidentally pushing a cork down inside a bottle when you were trying to remove it from the top? It is by no means a simple task to get the cork out of the inside of the bottle unless you have a special tool for the purpose. A piece of 14 gauge wire, with one end sharpened into a point which is bent into a spiral, will serve the purpose nicely. Insert the tool in the bottle, place the pointed tip under the cork, and pull upward.—Ivabelle Allan.

Making the Percolator Drip-Proof



WHEN you turn off the percolator, does it drip and soil the linen on the tray? This is a nuisance which can easily be done away with. Remove the spigot from the faucet. A hole runs through the center of the spigot to permit the coffee to drain through. Holding the spigot in an "off" position, drill two small passages in the shape of a V, the tip connecting with the drainage hole and the openings leading toward the nose of faucet.—T. Asgaard.

Funnel Twine Holder



TWINE is always needed around the house, but it is rarely at hand when wanted. A funnel makes a convenient holder for the twine ball. Punch three holes in the upper edge of the funnel, equidistant, and attach three strings which will hold the funnel suspended from the ceiling when their free ends are tied to a screw eye. The end of the twine from the ball runs through the stem of funnel and is drawn out as needed. This prevents unnecessary waste of string.—Vernon V. Johnson.

A Convenient Chopping Board for the Kitchen

COOKS can slice and chop vegetables and other foods rapidly by use of the simple device pictured in the drawing at the right. An ordinary staple is driven into a flat board just far enough to allow the tip of a pointed kitchen knife to fit under it. The staple thus acts as a hinge for the knife, and the blade can be manipulated rapidly, chopping the material passed between it and the board.—E. J. Smithson.

How I am Winning

Up aloft, free to go where he wills! Here is Fred Resico, soloing the Robbinsdale Waco school ship.

CHAPTER III—Solo!

STALLS this morning. Ugh! They make me sick.

Ever since I won MODERN MECHANICS' "Win Your Wings" Contest and started the ten hour flying course which the magazine is generously giving me as first prize, I have enjoyed every minute practicing at the stick.

But this morning was the first time I ever hesitated. It was the first time I'd just as soon have been on the ground. You see, I was pretty "hot" as Gene Shank, my instructor, calls it, and I could feel that he was going to turn me loose for a solo. I had been expecting it all day. So in the morning, when we took stalls as a lesson, I followed through. And though I was for a moment worried, the feeling wore off, and I got to like it by the time I had pulled the ship out of a half a dozen of the dreaded "diving flip flops."

Stalls are apt to occur under a variety of conditions, as Gene explained. The stall is a descriptive term used to signify the predicament of a plane when it has lost flying speed and the air is no longer reacting with the wing in sufficient quantity to give lift.

And it is a good term, for it is so descriptive. The ship just stalls, quits going, and falls dizzily until it is going fast enough in a downward direction to pick up flying speed again.

Too steep a climb will stall a ship. Often, in gliding into a field at a flat angle, close to the stalling speed, the uprising currents of hot air will jump the plane, or tumble it on the edge of the current.

As shown in the photo on the following pages, Gene explained that in normal flying attitudes the air flows past the wing solidly. The normal center of pressure is a little back of the center of weight so that the ship will dive a little when the power is cut off. In a stall, when the wing is at a high critical angle, the center of pressure travels back

My Wings

by **FRED RESICO, JR.**
Winner of Modern Mechanics "Win Your Wings" Contest

Solo flight! Fred waves goodbye to Modern Mechanics readers as he takes the hop that makes him a full fledged pilot. He has just finished Modern Mechanics' free ten hour course. **See page 94.**

and forth as shown at A and B. This travel varies with different wings. But in both cases it throws the machine out of balance and things start downward at a heck of a rate of speed. So, to make a finished pilot of me, we went through the stalls.

At about 2000 feet, after I had climbed in and we had taken off, I nosed the ship right up with the horizon out of sight under the wing. I held her there as per instructions. Nothing seemed to happen. It felt like normal flight. The motor was banging along like a railroad train, and for all I could tell we were going up, up, up.

Then the controls got soft. They waggled freely and without the hard resistance they usually exhibit. And the bottom fell out of everything. The ship went down by her nose, and my stomach seized. Just first reactions, that's all. I tried to pull her nose up. Gene batted the stick forward.

"No, no, no! Dive her! Get speed up." And he stuck her nose toward earth. All of a sudden the controls got hard again, and I flew her out of it. No trouble at all. Then some more, and still more.

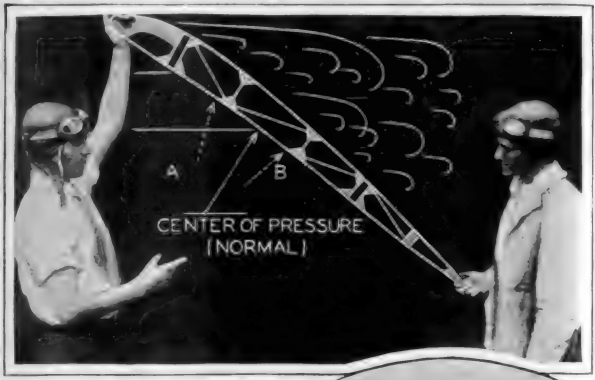
Stalls have no terror for me now. I only hope that I never have occasion to stall too close to the ground. A man's just out of luck if that happens.

Well, that finished the morning hop. I sat around until noon watching others take their time, and listening to the monkeyshines of Andy, the field's grease monkey, and the other lads who have done so much to make my stay worthwhile. They were setting up a brand new Heath Parasol on the field, and everybody was squealing about how cute it was and would it fly, and other foolish questions. When the little motor was started and made the loudest roar of any ship on the field, they all whistled. That little Heath has a lot of soup! I wanted to fly it, but I hadn't soloed, yet.

The time came around in the afternoon for the second lesson of the day.

The air was ideal. Just a sort of half bend in the sock, and the breeze held steady.

Danger of Stalling Pictured with Wing Section Model



Pilot Shank explains the stall, pointing out how the center of pressure travels forward and aft to upset balance when a gust, such as rises over a road, bounces the plane. See text.

The sun was bright and everything was fine.

I made three good landings, and felt pretty good. Gene didn't touch the stick or say a word. He never says anything unless you pull a boner, and not then until you have him half way to heaven—then how he rips it to you! Finally we made another good turn to the field, and another landing. Gene sort of reached into the back cockpit, looking for something.

Then he hopped out and I found it was the stabilizer he wanted to fix. Then he walked away a little, without saying anything, and said, "All right, go ahead!"

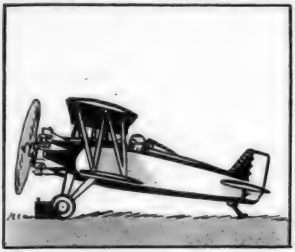
Naturally the ship was light and we went up in a hurry.

It is surprising the amount of difference just the load one passenger makes. It brought home to me pretty strong that the airplane was really fighting gravity to stay aloft. The nose seemed lighter and when I'd hold the nose down the ship would bang along faster. I cut the motor to around 1200 and found that I had about 600 feet altitude before I knew it. This alarmed me a little. We had been shooting landings from around 400 feet, and it was a bit harder to judge the field.

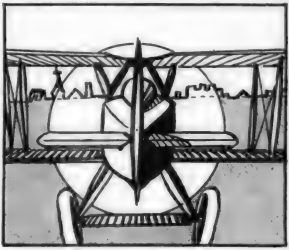
Then all of a sudden it came to me that I was alone and that I couldn't take any risks, knowing that there would be no instructor to yank me out of any trouble.

So I went a good way back of the field, and as it came toward me from the north, I cut the gun when it had come under the leading edge of the bottom wing.

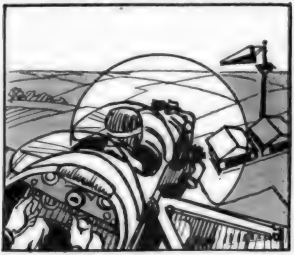
Here's a page of "Dont's" for all Beginners to Memorize



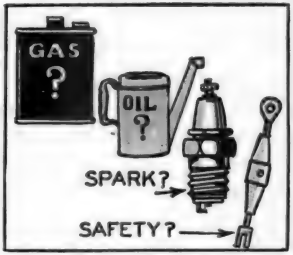
Don't take off before warming up the motor thoroughly. Don't warm the motor without blocking the wheels.



Don't try to fly with one wing down. Keep the wings level and the cowling line just a little above the horizon.



Don't try to land cross wind. Watch the landing field sock and head into the wind for a landing. Watch this! Never take off across the wind.



Don't take off without checking the gas, the oil, the ignition and the safetying of all flying and landing wires. Your life depends on it.

I never had the goldfish chase up and down my spine like that in my life before! But I gave her the gun and off we went.

It seemed as though the ship would never nose over into the glide. That is the difference between loaded flying and flying light, like I was. I shoved the stick forward, and I could see I was going to undershoot the field unless I gave her the gun. You see, I had figured that if I cut the gun where I usually did with two, while the ship was light, I'd overshoot the field. But I overdid it. I was undershooting and so I had to goose the motor a bit. The ship floated in like a mosquito going to a lawn party, and I managed to set her down nicely in a good three-point. The boys all ran out and shook hands while the airplane idled.

Well, it has been great, and I'm sure thankful for MODERN MECHANICS having given me the opportunity to meet as fine a bunch of fellows as I ever hope to see, and for giving me the ten hours in the air.

I can thank my instructor, Gene Shank, for drilling me well enough and watching me close enough so that I suffered not even a suggestion of accident. Never at any time did I even feel troubled or worried. Not a small part of this is due to the prestige Shank enjoys as a pilot. So—

It was fine, and made a perfect summer for me. Now for study, more flying, and more time, to make myself a real pilot.

So long, Gang!

HOW to BUILD the

Summing up the last of the details of the building of the Baby-Bullet Racing Plane, Stewart Rouse gives pointers on the wing construction.

The Wing Ribs—Part III

This is the last installment of Baby Bullet "How to Build." The complete article can be had by purchasing the Flying Manual from your local news dealer or by sending one dollar to Modern Mechanics' Circulation Department.

CONSULTING Fig. 17 you will see that the ribs are made of ¼"x¼" spruce fastened together with airplane glue, and 1/32" plywood gusset plates, with ⅜" 21 ga. flathead nails driven through them and clinched. The drawing, Fig. 17, shows the rib drawn accurately to scale, but separated into two halves by the vertical line at the 50 per cent point; this must be taken into consideration when drawing the wing section on a smooth one-inch board in pencil, using double lines to show the top and bottom curves, and the bracing pieces. Now glue and nail small blocks of wood along these outlines at two and three-inch intervals to hold the rib pieces securely in their relative positions, while nailing and gluing the gussets to one side; then turn the rib over on a flat surface and nail and glue the gussets of the reverse side. The jig must be modified to hold the slightly different aileron ribs.

The Wing Beams

Fig. 18 gives a clear conception of the top view of the right wing, and also of wing beams and aileron beams. Use the finest aircraft spruce for the beams, ordering it from a reliable aircraft supply house. Fig. 17 gives a clear impression of the full sections of the beams as maintained at strut points. At points between struts the beams are channeled carefully, as shown in Fig. 18, to produce an "I" beam section. This "I" beam cross section is by no means constant, because certain points along the beams receive large bending stresses, while other points receive little but compressive stresses, from end to end such as a column

The "Babe" zooms off the ground like a pursuit ship and climbs 1500 feet per minute. To the left is Ed Heath. These shots were taken at Mines Field, Los Angeles, at the recent air races.

"BABY BULLET"

undergoes. Follow the beam drawings carefully and remember that it is better to *leave* on too much wood than too *little!* Don't be a lightweight fan at the risk of structural failure. In cutting the channels in the beams, work with gouges small enough that a mallet is not necessary, as pounding may split the beams ever so little, which is dangerous. Cut the beams with sharp tools, leaving no splinters and *no* sharp corners—everything must be rounded in the channels. Cut the fuselage ends of the beams, as shown to fit the angle of the beam fittings on the fuselage. Cut the wing tip ends of the beams according to the drawings. Now drill the bolt holes in this manner: drill slowly through until the tip of the bit just shows on the far side; then drill from the far side to complete a smooth hole with no splintered edges.

The original "Baby-Bullet" had built-up three-piece wing beams, with solid flanges and plywood sides, but as the "I" beam solid beam is easier to construct and thoroughly reliable, it is de-

scribed in this article. The Department of Commerce frowns somewhat upon home-built, built-up wing beams.

The aileron hinge beams of the wings and of the ailerons are made according to Figs. 17 and 18, and are not much different from wing beams excepting that they are smaller and not channeled, but left of full section.

At this point in the construction of the wings, the ribs should be slipped to their proper places on the wing beams and fastened in place with airplane glue and nails driven through the vertical strips, in front of and in rear of the beams, into the beams. The aileron beams should now be slipped through the aileron ribs and fastened in the same manner.

Note that the last two ribs of the wing tip are special ribs of shorter chord than common and regular aileron ribs. They must be drawn to the same wing section as the common ribs, only of shorter chord. This may be accomplished by reducing the measurements given in Fig. 17 by a simple arithmetical reduction. These tip ribs must be fitted with care that their angle of incidence is the same as that of the rest of the wing, namely 0°. To fit them properly will require some cutting and shimming of the wing beam tips.

Metal Fittings of the Wings

Fig. 19 illustrates the metal fittings of the wings and presents patterns for the flying and landing wire fittings of the beams. Make these anchor fittings with greatest care, for they are vital. Do not bend them more than once in a place. Make up two of the double, built-up, steel tube, drag bracing struts that connect these anchor fittings, and weld their ends to the fittings as shown. These steel struts and their fittings *must* be installed on the wing beams *before* the ribs are slid on.

The ordinary ¾"x¾" drag bracing struts can be installed after the ribs are installed. Their ends are held in conventional strap fittings, as shown in Figs. 18 and 19.

The internal drag and anti-drag wire bracing is made of 10 ga. plated aircraft wire, with No. 324 turnbuckles. The forks of the turnbuckles are secured with clevis pins to the lugs on the front wing beam metal fittings, and the other ends of these wires are attached by means of clevis to the rear wing beam's metal fittings' lugs. Note that the wing tip drag strut's end metal fittings are modified to hold three bolts, making a secure end anchorage for the internal drag wire bracing. The drag strut end metal fittings of the wing butt are modified to wrap around the wing beam ends into which they are recessed a little to make smooth wing beam ends bearing against the fuselage wing fittings. Thus a good end-grain anchorage for the drag bracing wires is obtained. These combination strut and wire anchorage fittings are each attached by a ¼" bolt passing through their respective wing beam ends, see Fig. 18.

Leading Edge

Figs. 17 and 18 show the leading edge clearly. It is made from a long piece of 1"x1" spruce attached with airplane glue and nails to each rib's front tip while in its square condition. Now install the ⅜"x⅜" wooden brace strip shown in the upper left hand corner of the right wing, shown in Fig. 18, using small wooden blocks and plenty of nails and glue for end anchorage. With a small sharp plane carefully plane the leading edge to the cross section shown in Fig. 17. Now install the so-called false ribs which reach only to the rear of the front beam between the noses of the real ribs. Cover the front of the wing, top and bottom with 1/32" plywood back as far as the rear of the front beam. Use glue and ⅜" 21 ga. flathead nails to hold the plywood in place. ⅛" plywood must be applied with glue and ⅛" 21 ga. flathead nails to the face of the butt rib of each wing.

Trailing Edges

Fig. 20, C, shows how the 1" 20 ga. "Vee" section aluminum trailing edge is applied to the rear tips of the ribs with ⅜" 21 ga. flathead nails. Fig. 20, A, illustrates how a ¼" 18 ga. steel trailing edge tube is applied to the rear tips of the aileron ribs by means of ¼" 20 ga. copper straps wrapped and soldered around the tube and fastened with ⅜" 21 ga. flathead nails to the rib ends. The rib ends must be notched slightly to hold the tube firmly.

Wing Tips

The leading edge is bent back slightly to meet the tip of the front wing beam, where it is attached with small screws and airplane glue. Then the flattened end of

the curved 5/16" 18 ga. steel tube wing tip is screwed to both the leading edge strip and the end of the front wing beam to form a neat splice which is covered with a strap of 20 ga. copper, which is first soldered to the steel tube and then nailed to the front wing beam. This wing tip tube is fastened in a similar way, shown in Fig. 20, A, to the tips of the rear wing beam and aileron hinge beam of the wing.

Ailerons

The ailerons of the original "Baby-Bullet" were of the oblique type shown by dotted outlines in Fig. 18. This type of aileron is extremely difficult to build and to hinge. The ailerons used in the original were welded up of small steel tubing and were very successful. The straight-type aileron shown in the drawings by the author, Fig. 18, will be found, however, much easier to construct and entirely satisfactory.

At this period of the construction of the plane it is only necessary to saw between the aileron hinge beam on the wing and the hinge beam of the aileron to entirely separate the aileron structure from the wing structure. Apply ¼"x5/16" filler cap strips to the tops and bottoms of these beams, between ribs, to give an even edge, see Fig. 20, D. Brace the aileron internally with ⅜"x⅜" spruce strips, as shown. Fig. 17 shows the construction of the aileron horn, which is made of 16 ga. sheet steel with 3/16" plywood applied to both sides and held by rivets passing clear through, as in a butcher knife handle. The 16 ga. steel horn body has a large double lug bent over at right angles at the front. This flat lug is attached as shown to the rear side of the aileron hinge beam by two 8-32 machine bolts. The horn body is attached to the 3/16" plywood web of the horn rib by two more 8-32 machine bolts. Aileron hinges are each made of two eyebolts passing at an angle through the tops of their respective hinge beams, and having their eyes laid together and held by a clevis pin passing through both eyes, see Fig. 17. As the beams are very light, they have to be reenforced at the hinge points by one-inch thick plywood blocks screwed and glued to the beams. To prevent the eyebolts being drawn too far into their beams, large square washers are welded to them. A web of ⅛" plywood is applied to the inner end rib of the aileron and to the adjacent end of the common rib at the inner end of the aileron opening in the wing.

Internal Wood Bracing of Wings

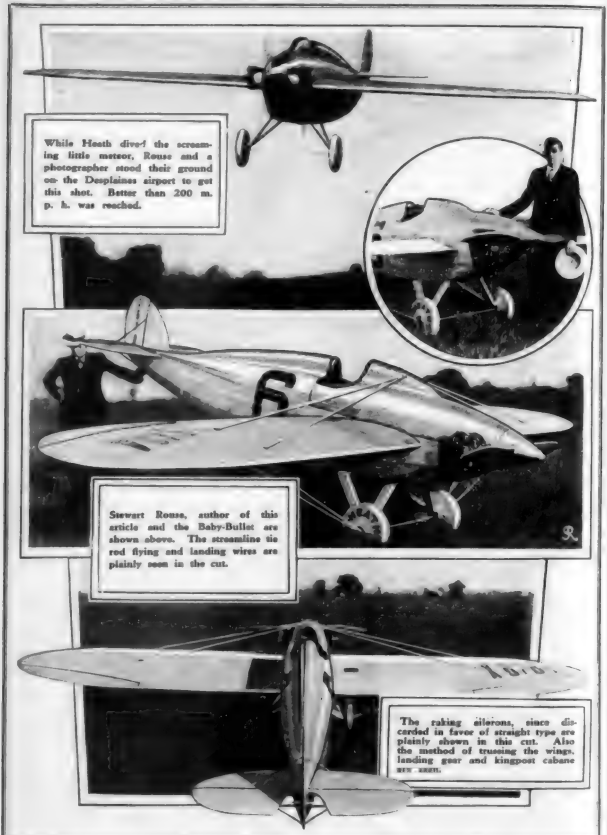
⅜"x⅜" wood braces are applied inside the wing as shown in Fig. 18. First, wooden blocks are nailed and glued to the members to be united by a brace, then the brace is nailed and glued both to blocks and the members to be joined together.

Aileron Control Pulleys and Cables

Two 1¾" aircraft control cable pulleys of the common type, having sheaves possessing an eye with an eyebolt attached, are attached, as shown in Fig. 18, one above the other, to the rear face of the rear beam in front of each aileron horn by passing the eyebolts through the beam, resulting in an entirely flexible mounting. The control cable used is ⅛" extra flexible control

Here is Ed Heath, small of stature, alongside the Baby-Bullet. Heath makes the midget racer look larger than it really is. The waist of the editor of Modern Mechanics comes right on a line with the nose spinner, which caps the tiny 4-ft. walnut propeller.

Racing "Baby-Bullet" Shown Diving at Two Hundred Miles Per Hour!



The spread of shots shown here was taken while the Baby-Bullet was being specially put through her paces for representatives of Modern Mechanics at Desplaines Field, Ill. High speeds were reached.

cable, with ends made as shown in Fig. 3, Part I, of this article.

Flying and Landing Wires

Flying and landing wires are 10-32 streamline tie rods which may be obtained from aircraft supply houses on short notice. Use the regular terminal clevis except at the crown plate of the cabane where the threaded ends are passed through the holes provided and castellated nuts run down to hold them.

Tail Surfaces

Fig. 21 will give a good idea of the external appearance of the empennage, or tail surfaces. Fig. 22 shows everything necessary to know to construct them. The entire empennage is welded up of steel tubing, and this work should go quickly. There is little difference between the horizontal stabilizer-elevators assembly and the vertical-fin-rudder assembly save size and position. The stabilizers have $\frac{5}{8}$" 20 ga. steel tube hinge beams, while the elevators and rudder have $\frac{5}{8}$" 18 ga. hinge beams reenforced, as shown, by telescoped pieces of 11/16" 22 ga. tubing at the horn positions. These reenforcements are welded and riveted in place. The control horns are simple two-piece affairs cut from sheet steel, welded to their hinge tubes and together at their tips. Their edges are flanged for stiffness, as shown in Fig. 22. The rudder control horn, being in the air stream, must be streamlined with balsa wood and fabric. The ribs are made with 3/16" 20 ga. steel tube cap strips. The leading edges are $\frac{1}{4}$" 18 ga. steel tubes, while the trailing edges are of 3/16" solid steel rod. Internal diagonal bracing, as shown, is accomplished with $\frac{1}{4}$" 20 ga. steel tubes. In Fig. 22, the AA' detail of the horizontal stabilizer-elevators assembly shows the typical rib section of these surfaces. It is a streamline wing section set at 0° incidence—that is, its center line is parallel to the top longeron. Note that instead of welding the cap strips of a rib to the leading or trailing edge at the same point, the strips are slightly separated and welded on side by side. At the

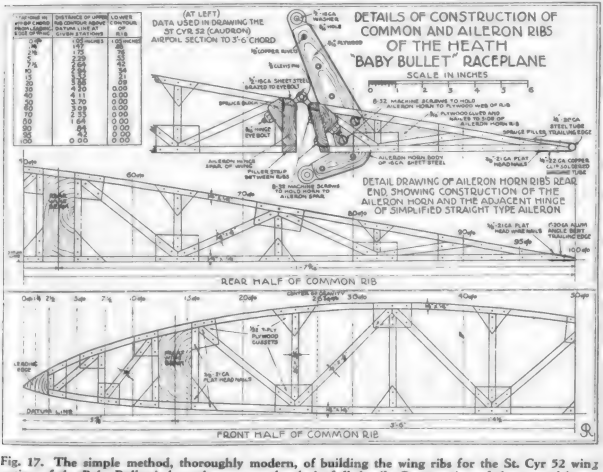
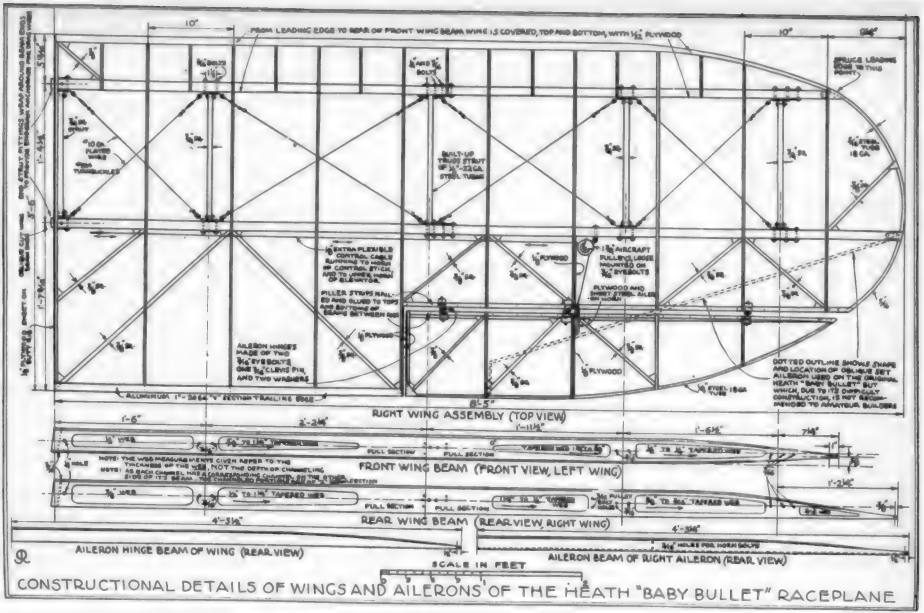


Fig. 17. **The simple method, thoroughly modern, of building the wing ribs for the St. Cyr 52 wing section of the Baby-Bullet is here shown very clearly in full detail. Construction of the control horns is also made clear.**



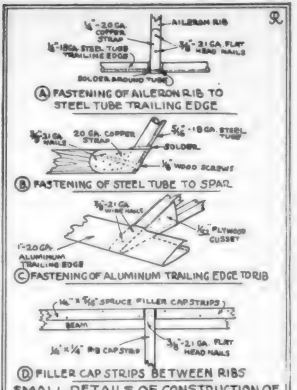
CONSTRUCTIONAL DETAILS OF WINGS AND AILERONS OF THE HEATH "BABY BULLET" RACEPLANE

trailing edge it will be necessary to flatten the tubes slightly for several inches to maintain the rib section. ⅝" 18 ga. lugs must be welded to the hinge tubes of the horizontal and vertical stabilizers to receive the ends of the 8-32 streamline tie-rods which brace the empennage. The hinges are made of ⅝" 18 ga. steel straps wrapped around the hinge tubes of the rudder and elevators and held to the hinge tubes of horizontal and vertical stabilizers by single 3/16" bolts passed through the tubes and straps, as shown in Fig. 22. Wherever a bolt passes through a tube, the hole must be reenforced by a piece of 16 ga. tubing inserted in the hole and welded in place, forming a "boss," see detail in Fig. 22. Small clips of ⅝" 18 ga. sheet steel are welded to the leading edge of the horizontal stabilizer as shown, to be held to angle brackets on the fuselage by 3/16" bolts. The hinge tube of the same stabilizer is held to the fuselage by two 3/16" bolts attaching it to clips on the fuselage near the stern post. The vertical fins' attachment to the fuselage is accomplished in this way: its hinge tube is telescoped into the stern post several inches, until stopped by a large washer welded to it, see Fig. 22; its front end is attached both to the small continuation of the fuselage turtleback built integral with the horizontal stabilizer and to the clip welded on the leading edge tube of the horizontal stabilizer by a 3/16" bolt welded in the lower end of the fin's leading edge tubing. Note that the lowest rib of the fin is shaped to fit the small turtleback and to have an inspection opening for the top horn of the elevators.

Control cables are of ⅛" extra flexible control cable. The right rudder control cable leads from the right horn of the rudder to the right end of the rudder bar. The elevator cables, however, are a different matter. The cable that leaves the rear of the torque tube goes to the top elevator horn, while the cable attached to the rear lug of the control stick goes to the bottom elevator horn.

Assembling

It is good practice to set the ship up complete before covering to make sure that everything is as near perfect as possible. Lock all nuts on with cotter pins, or by a slight riveting on the end with a small ball peen hammer. Do not rivet much, as it weakens the bolts. Just nick the bolts enough to hold the nuts. Cotter pins are preferred. Inspect with greatest care. Discard any hard wires that show any nicks, splits, or that have been bent more than once in a place. See that all wires are taut but *not* tight. See that control cables operate smoothly and drag nowhere. If they drag, try to remedy it, but in some places it may be necessary to install cable guides which can be obtained from aircraft supply houses. At this time determine just where each cable will pass through the fabric covering of the plane, and take measurements so that holes may be cut at proper places for the cables to pass through when the covering is on. Check everything for accuracy in every way possible. With the top longerons level the bottom of the wing ribs should be level too, and the horizontal stabilizer of streamline section should be set with the center lines of its ribs level. It is possible to make the ship more stable at low speeds by giving the wing a 2° angle of incidence, but this will slow up its top speed about 15 m.p.h. With the control stick exactly vertical, the ailerons should be



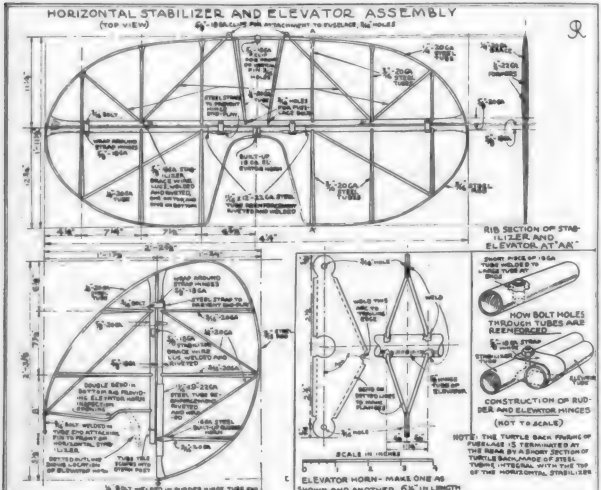
These details show the method by which the trailing edge is covered with aluminum stripping and how the aileron ribs are secured.

continuations of the wing in front of them and the elevators should continue the streamline section of the stabilizer in front of them.

Give all metal parts three coats of high grade black auto enamel, and finish the woodwork with two coats of shellac and two coats of fine spar varnish. The control cables should be heavily greased with clear grease.

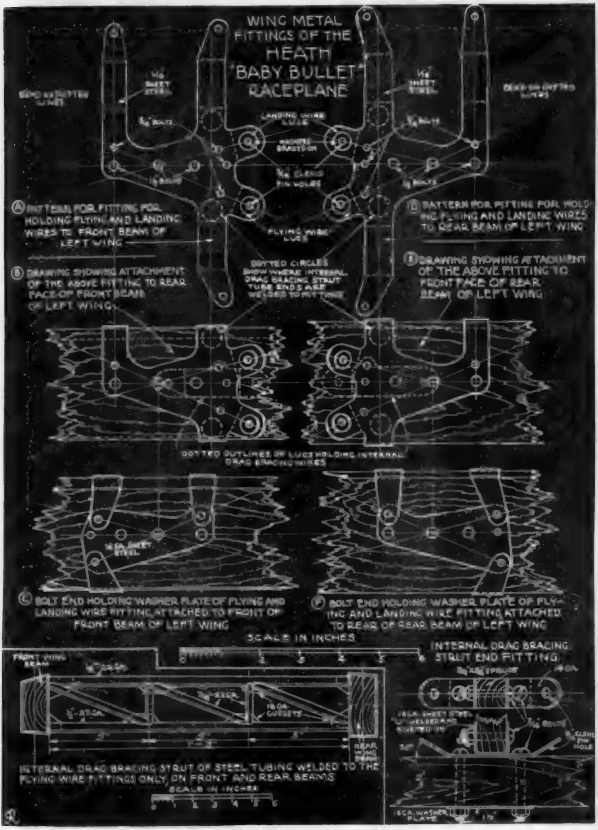
Covering the Fuselage

In covering the plane use only best Grade A airplane fabric. Wrap the longerons tightly from end to end with 1" binding tape. The method of wrapping should be the same as for a spiral bandage. Fasten the ends with a little wing dope brushed on. Wrap the sternpost. Cut a panel of fabric to fit the bottom of the fuselage, with about 3/4" overlap all around the edges. Sew it with heavy linen rib cord to the binding tape on the longers and stern post, and tack to the small, front bottom fairing with 1/4" copper tacks at B, see Fig. 2, Part I, of this article. The fabric sides of the fuselage are applied in the same manner. The fabric should be stretched snugly by hand while applying. It requires four strips of fabric to cover the turtleback fairing. Tack these strips to the nailer strips provided, letting them overlap each other about 5/8", and sew, also, to the top longeron wrappings. When this is done, tape all the seams with 2" pinked edged finishing tape saturated with wing dope and brushed out smoothly at the edges. Now make the control cable



The details for the horizontal stabilizer, the method of covering and the details of the control horns, flipper clips and rudder assembly are made clear in this drawing. Note the use of 3/16 inch, 20 gauge shelby steel tubing. Control horns are welded.

Details of Metal Fittings for Wings Shown in Blueprint Below



The fittings for holding the flying and landing wires must be built with extreme care, as they absorb all of the stresses of flying and landing. The internal drag strut bracing, of welded construction, is shown in relation to the spar cross-section at the point of installation.

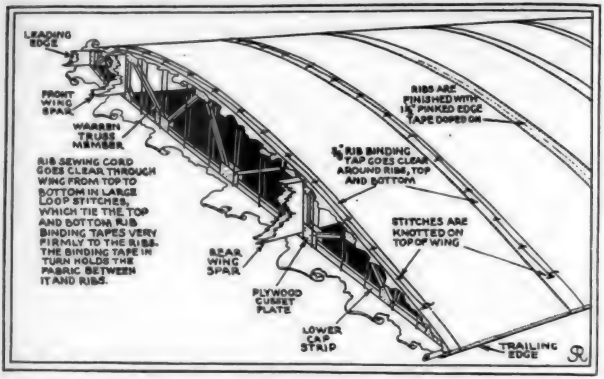
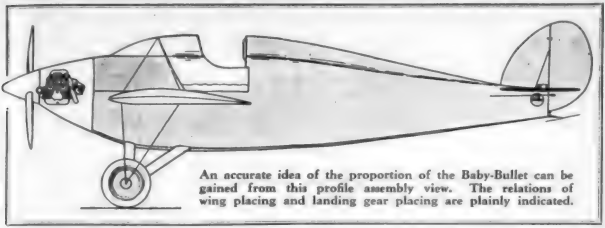


Fig. 24. In covering the wings of the Baby-Bullet, a piece of linen large enough to go from trailing edge around the leading edge and back to the trailing edge again is stitched on as shown.

Covering the Wings and Empennage Surfaces; the Rudder

outlet holes in the fuselage and reenforce each hole with heavy imitation leather doped on each piece of leather having a cable hole in the center. Provide inspection holes as shown to inspect the lower elevator horn. The fuselage should now be given two coats of clear and two coats of pigmented wing dope.

The easiest method is to cut a piece of fabric large enough to cover the wing on both sides at once, then fold it over the trailing edge and tack it temporarily to the leading edge with ¼" copper tacks. Tack it along the butt rib and sew it together around the wing tip. Gradually tighten the cloth by re-tacking and re-sewing to remove all wrinkles and fullnesses. The cloth should be stretched quite tightly from end to end along the leading edge. It is unnecessary to stretch the rest of the cloth extremely tight as the wing dope does that. Trim away excess cloth. Cut away the cloth in the aileron opening of the wing, leaving about 2" overlap. Tack the cloth to the aileron hinge beam on the wing and to the plywood web of the last common rib. Space the tacks 3" apart. Have the edges of the cloth overlap each other along the leading edge, around the aileron opening, and across the butt rib. Do a neat, smooth job. Now cut 7' 6" lengths of ½" rib binding tape and wrap one length around the wing over each rib, tacking the ends down at the leading edge. Thread an 8" steel needle with linen rib cord and, starting at the trailing edge, push the needle clear through the wing, touching one side of a rib, and then bring it back through on the other side of the rib. The result will be a loop of cord clear around the rib including and passing through both top and bottom binding tapes and the wing fabric beneath the tapes. Draw the loop snug and knot with a *square* knot on top of the rib. Sew forward in this fashion, looping and knotting at 4" intervals until the leading edge is reached, see Fig. 24. Now take 7' 6" lengths of 1½" pinked edged tape and wrap them on just as the binding tape was wrapped, with the ends overlapping at the leading edge. This tape must be heavily saturated with wing dope and stuck down with a brush to strengthen the sewing and to give the seams



An accurate idea of the proportion of the Baby-Bullet can be gained from this profile assembly view. The relations of wing placing and landing gear placing are plainly indicated.

a finished, smooth appearance. Run a 2" pinked edged tape across the leading edge, around the wing tip across the trailing edge, as a reenforcement and to hide the rows of tacks and stitches. Cut out large strips of cloth to tape the butt rib and the faces of the aileron opening. The edges of these pieces should be frayed by removing a few ravelings from them, should overlap on the upper and lower surfaces of the wing about 1", and should be doped down neatly. The entire wing should now be given two coats of clear and two coats of pigmented wing dope. Do not use more dope than this, or the ribs may be distorted by tension. The ailerons are covered in the same way as the wings.

Covering the Empennage

The tail surfaces are covered in the same way as the wings. However, the leading edges, trailing edges, and hinge tubes must be wrapped to permit sewing the fabric to them.

Balancing the Raceplane

Note that in Fig. 17 the location of the vertical center of gravity of the plane is located at 26¾% of the chord from the leading edge. This is where it has to be if the ship is to fly well and be stable. Otherwise the plane will be unnecessarily dangerous. Make sure that this condition is fulfilled in this way: Make a light, stiff, wooden frame or cradle of 2"x4" lumber to go under the fuselage and support the weight of the plane *only* at the strut points of the landing gear. Now balance the ship on this cradle on a wooden knife edge made of a 2"x4" piece of wood on strong supports. It takes several men to perform this operation without injuring the airplane. Then your Bullet is ready to fly.

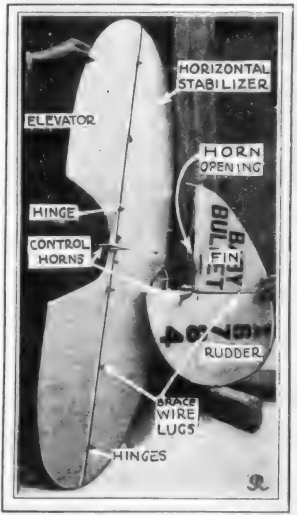


Fig. 21. A good idea of the component parts of the tail assembly can be gained from this photo. The horizontal stabilizer is barely waist high.

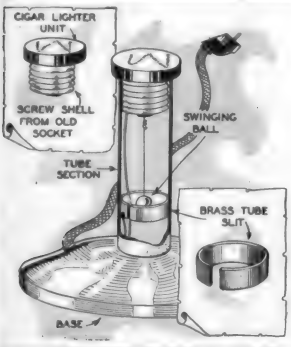
AMATEUR ELECTRICIAN

Edited by THEODORE ALLEN

Many are the useful articles the home dabbler in electrics may make to amuse himself — toy trains, model boat motors, cigar lighters, simple motors and toys almost without end of variety. Each month Modern Mechanics presents something new for Amateur Electricians in this department.

This Cigar and Cigarette Lighter Works Automatically

A VERY simple electric cigar lighter that will automatically light up and is ready for use instantly is described here. It can be made from parts that can be picked up from the junk pile or can be bought anywhere, the entire lighter costing but a few cents.

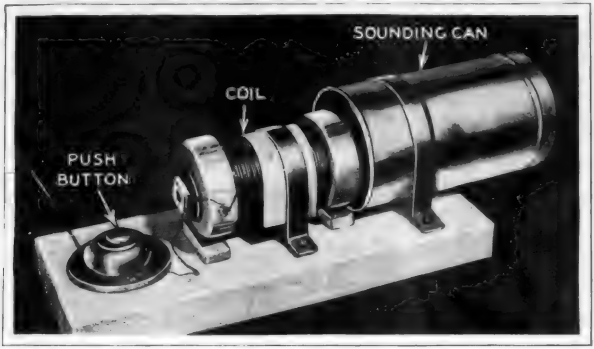


When you tip this cigar lighter, the ball makes contact, the red M glows, and presto! — the cigar is lighted. It can be made in an hour.

A base is first procured. This can be turned out on a lathe if one is handy or any metal or wood base about three or four inches in diameter can be used.

A hard rubber or fiber tube about 4 inches long with an inside diameter of 1 1/16-inch is necessary. In the top end of this tube the brass shell of an old electric light socket is fastened. If the tube is of diameter mentioned it will fit in tightly. From the center contact of the socket a small wire loop is soldered and a short length of wire, looped at one end with a small weight at the bottom is inserted into this loop so that the weight swings freely in any direction. A piece of brass or copper tubing about ½ inch in length and 1 inch in diameter is cut and a slot is made in the side. The ring is pulled open slightly and then forced into the rubber or fiber tube so that it cannot move when in place. The ring is placed so that the weight is about in the center of the ring. A length of double silk wire is now obtained and one wire end soldered to the outer shell of the socket and the other end to the brass ring, the other ends terminating in a regular plug. Now fasten the fiber ring to the base as shown in sketch. To work the lighter it is merely lifted from the table and is tilted slightly.—Herman R. Wallin.

Making a Simple Electric Horn from Various Old Parts

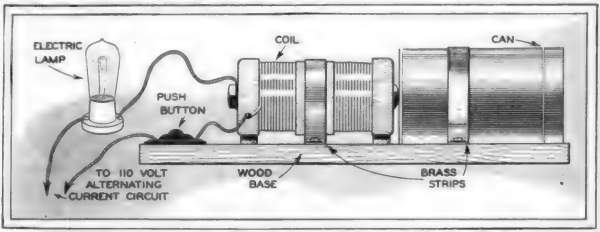


Exactly the same in principle as the horns used on cheaper motor cars, this noise maker is adaptable to shop or factory use. It is extremely effective in producing a racket.

AN ELECTRIC horn which can be heard almost a block away can easily be made by any boy.

The horn proper is a baking powder can mounted upon a board by means of a brass strip bent around it and fastened to the board with screws. The working part of the horn is a spool of wire such as sold for radio purposes. A twenty-five cent spool of No. 20 cotton covered wire is very satisfactory. Run a bolt through the hole and screw on a nut, using washers. There will be one end of the spool of wire free and one wire from the push button free. These two ends should be connected with the 110 volt lighting circuit, using a lamp in series.

When the alternating current flows around the wire, the iron bolt becomes a magnet which attracts the iron bottom of the can to it. Now alternating current is a kind of current which flows one way, stops, turns around, and then flows the other way, so when the iron bolt has become a magnet and attracted the bottom of the can, the current changes, first stopping. Can must be adjusted to lie just the right distance from bolt.



An electric lamp, preferably a carbon filament, is hooked in series with the coil, the armature of which is set against the bottom of a tin can, the bottom serving in this case as a diaphragm.

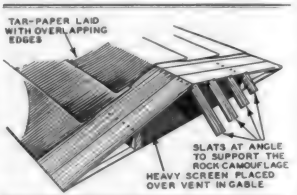
Digging a Pirate's Cave

By HI SIBLEY

WHILE excavating for a new house in the weed-grown lot next door, workmen unearthed a surprising maze of caves and trenches. Evidently they had been dug many seasons before because bushes and weeds were growing luxuriantly from the soil spread over the roofs. Considerable grading and no end of fancy language were required before the lot was in shape to build on. But it proved that a well-made cave is about as substantial a clubhouse as a boy can make.

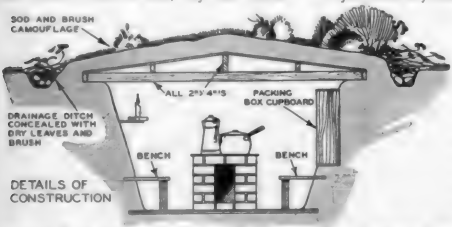
With cold weather coming on this type of rendezvous is timely. Properly constructed, the disadvantages common to the ordinary cave—poor ventilation, dampness and danger of cave-ins—are entirely eliminated. Mothers need have no fear about letting their boys join such a neighborhood underground organization. If constructed as shown here such a cave is safe, dry and warm.

An important feature is the roof construction. This is of semi-trussed design and can be built from old lumber collected in the club members' backyards. It will drain well and keep the cave warm and dry in the meanest kind of weather.



Here is shown the kind of roof to put on a cave.

If you have any choice of location, select a site on a knoll, preferably where there is shrubbery but no large trees, since it will be a hard job to cut through the roots. Besides, that isn't fair to the trees. In addition to good drainage at the start, the knoll assures a commanding view of surrounding territory.



Located in shrubbery on some dry knoll, a pirate's cave affords safe shelter for neighborhood boys' clubs. Happy hours of plotting adventurous deeds can be spent under the dry protection of a well built cave.

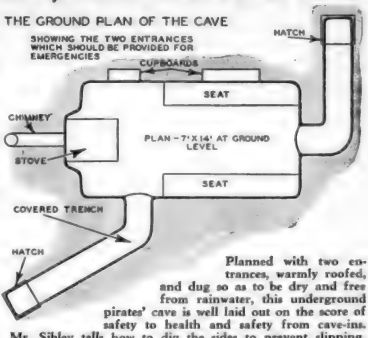
Grade the excavated dirt away

from the hole in an even slope. This helps to conceal its location. Piles of dirt would give you away in a hurry, and scouts from that tough gang over on Boiler Avenue would soon have your stronghold listed for future attack.

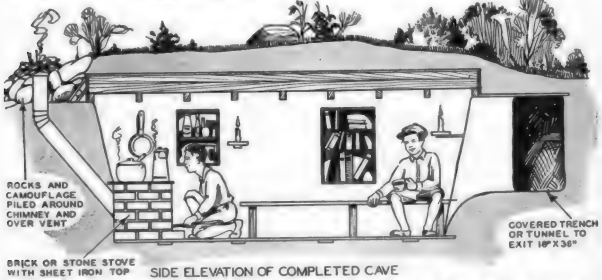
Save all the flat stones for the fireplace, unless bricks are available. The latter will make a better fireplace, however, without mortar. The roof or ceiling joists should extend at least a foot on each side of the excavation. The ridge support is made up of two two-by-fours laid one on top of the other, as shown in the diagram. The roof boards should be covered with tar paper or old canvas, or in a pinch, several layers of newspapers. At one end of the roof, tack heavy wire screen under the gable, and further protect this with a row of slats set at an angle. These are to partially support large stones placed against them to conceal the vent. If the stones are big enough they will not impede air circulation to any great extent. A trench is dug for the stove-pipe and, when this is laid, covered over again with dirt. Of course, it will be an advantage to have the chimney as far away from the cave as your supply of stove-pipe will permit. However, be sure that the top of the chimney is one or two feet higher than the stove. Otherwise your draft will be sluggish. Stones should be piled around the chimney to hide it, and it wouldn't be a bad idea to throw over the chimney itself some old junk, such as rusty washboilers, etc., that will not interfere with draft. In case a potential enemy sees smoke rising he naturally would assume it to be a rubbish fire.

Cover the roof with soil and then spread leaves and brush over it in a natural manner. Next spring new growth will spring up from the seeds thus sown. Dig a drainage trench around the "eaves" and fill with loose brush to hide it.

Plan for Pirates' Hideout Under Ground

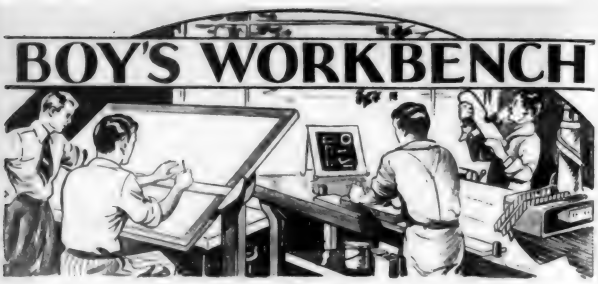


Planned with two entrances, warmly roofed, and dug so as to be dry and free from rainwater, this underground pirates' cave is well laid out on the score of safety to health and safety from cave-ins. Mr. Sibley tells how to dig the sides to prevent slipping. Note the manner in which the stovepipe is lead out.



SIDE ELEVATION OF COMPLETED CAVE

With the two entrances some distances apart, and camouflaged, and with the stack well hidden in brush, boulders, and non-inflammable refuse, the location of the cave is difficult to detect, especially if its site is naturally hilly, as on a knoll. Candles are used for lighting the cave as shown.



Edited by A. NEELY HALL

With the onset of winter the time for indoor activity arrives. This month Mr. Hall presents plans for a winter kennel for the dog, an indoor tennis game, and a number of other interesting items. Mr. Hall is widely known to boy craftsmen as author of "Carpentry and Mechanics for Boys," "The Boy Craftsman," and other handicraft books.

Doorstep Kennel Makes Snug Winter Quarters for a Dog

AN under-the-porch kennel like that in the photograph is one of the best year-round quarters for a dog, providing as it does protection from winter winds and summer heat. Your porch may differ from the one in the picture, but probably the plan can be adapted to it. The space under the steps is utilized for a vestibule. Both sides are boarded up, inside of the step stringers, with an opening left in one or both sides, for a doorway or doorways. At the end of this space, there is another partition with a doorway leading into the larger space under the porch. This space also is enclosed, and there is a sliding door to shut in cold weather and whenever you want to confine your pup to quarters. Make the door to slide up and down, as I have rigged mine, with a chain or wire running from its top up and over clothes-line pulleys and thence through a basement window. Then you can open and close the door from the basement.

This kennel, built under the steps, makes a snug house for the pup when lined with tar paper.

If you can, lay a concrete floor under the porch. It will prevent rats and mice from undermining the place, and makes a dry foundation for the straw bed. Three inches of concrete upon several inches of cinders will be sufficient. If you cannot make a concrete floor, cover the floor area with several inches of cinders or gravel, raising the top to several inches above the outside ground level. Wet down this filling, and tamp it down until compact.

Sheathe up the sides of the kennel with drop-siding, shiplap, bevel siding, or matched flooring, using whichever is best suited to the house.

This Cabinet Can Be Used as Gun Rack or Storage Stand

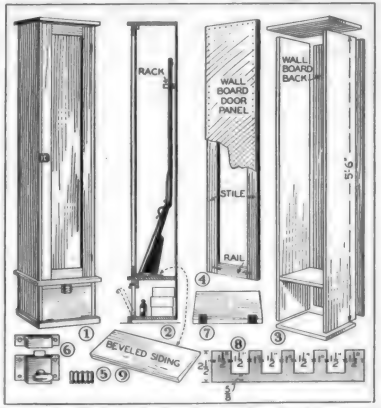
NO matter what your hobby may be, you will have use for a locker like the one shown in Figs. 1 and 2 of the diagrams. It was designed primarily as a gun cabinet, but you can substitute shelves for the gun rack.

The cabinet is of simple construction, with parts butted together. The back is of wallboard, the front has a door with a wallboard panel. All of the work has been planned with the thought that many of you who will want to build the cabinet have had no experience in joinery. Those of you who have had manual training can rabbet and groove the sides to receive the back and shelves, and can build a glass door, with stiles and rails mortised and tennoned.

Figure 3 shows the cabinet partly assembled. The length of the side boards is given as 5 feet 6 inches, but you can make it whatever you wish. Ten inches is a good width for the sides, or 9½ inches, the actual width of 10-inch boards. The inside width of this cabinet is 12 inches. Cut the lower shelf of that length. Cut the bottom 1½ inches longer, if the side boards are ¾ inch thick, so that they will lap over the lower ends of the side boards. Saw the top from a 12-inch board, and cut it about ¾ inch wider than the side boards, and of the right length to project ¾ inch on each side.

Nail the top and bottom to the ends of the side boards, and fasten the shelf between the sides about 10 inches above the bottom. Buy a piece of wallboard and cut a piece of the correct width for the back. Mark it off carefully, making certain that the corners are square, and cut with a saw, or score with a knife and break along the scored line. Tack the wallboard to the back of the cabinet, but first coat the edges of the side, top and bottom boards with glue, also the edges of the wallboard, to make a tight job.

Build up the door frame as shown in Fig. 4. Make it ½ inch shorter than the opening and ¼ inch narrower. One-by-two strips are wide enough for the stiles and rails. Coat the rail ends with glue, nail the stiles to them, and then reinforce each joint by driving in a wood-joint fastener, on the ends and on the inner face of the frame (Figs. 4 and 5). Cut a piece of wallboard to fit the frame, coat its edges with glue, to a width of 1½ inches, also coat the inner face of the frame, and tack in place. When the wallboard is glued and tacked in place, smooth off projecting edges with a plane and sandpaper. Hang the door with a pair of hinges set into the edge of the stile and the jamb. Nail a narrow strip to the top and another to the lower shelf, just inside of the door, for stops. Screw a cupboard catch (Fig. 6) to the face of the door.



Shelving can be built into this cabinet instead of gun rack.

The bottom cupboard has a board drop-leaf. Fit a strip under the lower shelf, then cut the drop-leaf to fit the remaining opening. Hinge it at the bottom (Figs. 2 and 7), and screw a cupboard catch to the top.

Trim up the cabinet with a square molding across front and sides, at the line of the bottom shelf, and another around base.

Figure 8 shows a notched stick for a gun rack. Fasten a piece of beveled siding (Fig. 9) to the lower shelf to support the butts of guns.

Table-Tennis Set Makes Great Indoor Game

Table tennis follows same rules as outdoor game.

BROUGHT out as a fad when your Dad was a boy, table tennis has outlived the fad period and established itself as one of our standard indoor games. Indeed, its popularity is greater now than ever before. Everybody enjoys it and everybody can play it. It has the fascination of lawn tennis, but is not as strenuous a game.

You can buy table tennis outfits wherever games are sold. But you can easily make one, every part except the balls. You can buy table tennis balls separately. Small rubber balls may be substituted, but as they are much heavier than the celluloid balls of the regular equipment, it will be better to invest in two or three of the latter.

A large library table, or a dining table extended, makes an excellent tennis court. If one is not available, buy a piece of wallboard 4 feet wide and 8 feet long, and tack it to a frame built of 1-by-2s.

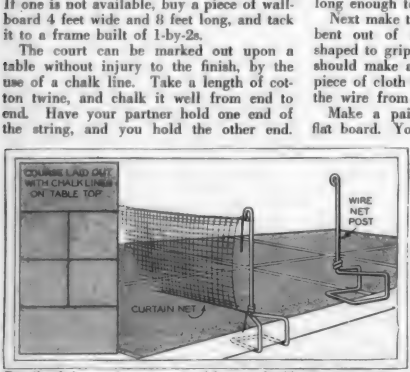
The court can be marked out upon a table without injury to the finish, by the use of a chalk line. Take a length of cotton twine, and chalk it well from end to end. Have your partner hold one end of the string, and you hold the other end. Lower the string to the surface of the table, at a point where you wish to mark a line, and while it is pulled taut, grasp it at its center with two fingers, raise it an inch or so, and let it snap back to the surface. This will make a straight, well-defined line that can easily be washed off when you are through playing. The layout of a table court is suggested in the diagram.

If you must build a wallboard playing surface, mark it off with crayon or with strips of gummed tape. The wallboard frame may be supported upon small tables, chair backs, boxes, or a pair of horses.

The tennis net may be made of a strip of curtain net, marquisette, or other goods. Bind the upper edge and the lower edge with a strip of tape, and cut the tape ends long enough to tie to the supports.

Next make the tennis-net posts. They are bent out of No. 8 wire, with the base shaped to grip the edge of the table. They should make a snug fit. Slip a blotter or piece of cloth over the table edges to keep the wire from marring the surface.

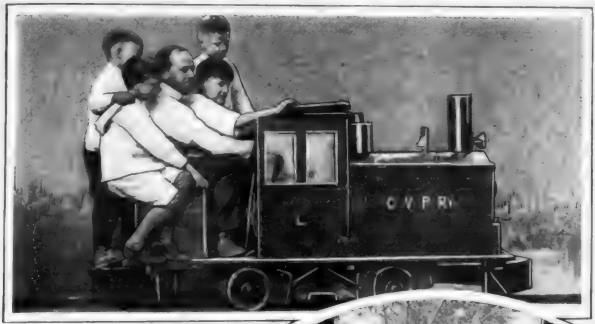
Make a pair of tennis rackets from a flat board. You can saw them out of box boards $\frac{3}{8}$ inch thick, but plywood would be better if you can get it, because it does not split. You can reinforce the box board rackets by gluing muslin over both faces. Mark out the rackets as shown in the diagram, 6 inches across the face. Shape the edges as symmetrically as possible.



Details of the tennis net posts and layout of table top shown above.

Rules for table tennis are similar to those for the outdoor game.

Free Vest Pocket Railway Has Two Miles of Trackage



W. Cecil Gage, owner of the Vest Pocket railway, is shown above with a group of future railroad magnates seated on one of his locomotives.

THE Vest Pocket railroad charges no fare but pays dividends in pleasure for the owner and juvenile tourists every summer. It runs over two miles of track on the estate of W. Cecil Gage, at Fishkill, N. Y. It has miniature rolling stock, three stations, switches, work shops, block signals, turn tables and other equipment.

Looking out through the doorway of one of the workshops of the Vest Pocket railroad, showing some of the road's rolling stock, including sand cars and locomotives ready for traffic on the two-mile line.

The "Toonerville Trolley" of the Vest Pocket railway was built for workaday uses but when traffic is heavy it is used to haul passengers who are not particular about riding in a springless coach.

Easy STUNTS

Amusing tricks can easily be performed with sheets of paper if you know how to fold and cut or tear to obtain intricate and unusual patterns. Soldier hats and headpieces of other styles as well as the Jacob's ladder can be speedily produced.

by KEENAN H. WARD

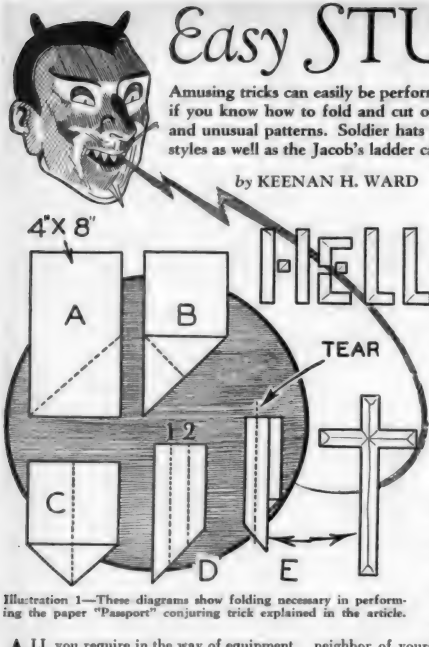


Illustration 1—These diagrams show folding necessary in performing the paper "Passport" conjuring trick explained in the article.

ALL you require in the way of equipment is a sheet of paper. All you need to do is fold it several times, here and there; tear it, so and so . . . and there you are with a clever paper hat, a mariner's wheel, a paper ladder or some other clever little knick-knack of entertainment or utility. Believe it or not, there's real fun in these tricks and twists with a sheet of paper.

Among paper conjuring tricks, perhaps the most amusing is the "Passport" effect. Briefly, the thing is this: The performer takes an oblong piece of paper, about 4 inches by 8 inches, and folds it as shown by the dotted line in Diagram A of Illustration 1. He then folds it again, as shown by the dotted line in Diagram B, and again as shown by the dotted line in Diagram C. The paper at this stage is shown in Diagram D. A final fold, creasing along the dotted line No. 1, and bringing the edge of the paper to the dotted line No. 2, will result in a piece of paper like the one pictured in Diagram E. This is then torn or cut down the dotted line as indicated. The result is an odd combination. The single upper layer of the tear, as indicated by the arrow, will, when opened up, form a perfect cross; while the remaining pieces can be assembled to form the word "Hell"!

The effect is entertaining only when done in connection with a short story. Your "patter" should run to this effect: You have a dream. You are walking down the river Styx, and happen to meet that "beloved" neighbor of yours, the ukulele player. The ukulele player notices the paper which you hold in your hand. He asks what it is. You tell him that it's a passport to heaven. He has none, and attempts to snatch yours away. The paper is torn as a result. Of course, you retain the piece that will form a cross, so that on arriving at the Pearly Gates, you are at once admitted by St. Peter. That gentleman, however, sends the ukulele player elsewhere when he perceives the contents of *his* "passport."

Perhaps the oldest and most popular of all paper stunts is the tearing of the so-called circular, or, as they are sometimes known, wheel designs; and without a doubt the most popular of these designs is "The

with Paper

Mariner's Wheel," as shown in Illustration 2. To make this wheel, or to make any variation of this popular effect, is quite simple.

Like this: Take a large square of paper and fold it across the center, as shown in Diagram A. Then, fold it again as

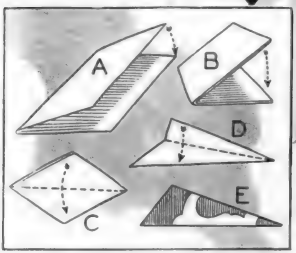


Illustration 2—The girl is holding a "Mariner's wheel," a favorite design derived from tearing paper. The wheel is shaped by folding and tearing as diagramed at the left.

shown by the Diagrams B, C, and D, producing a piece of paper shaped like Diagram E. Now, hold the paper firmly and tear away the shaded portion of Diagram E. The white portion of the design, when opened up, will give the very pleasing mariner's wheel pictured in the photograph.

Other designs can be worked up as suits your fancy, as almost any haphazard design produced symmetrically around a circle produces a pleasing figure. The size of the paper can be varied to suit. For close work, a sheet of paper 24 inches square will give a good effect, while on the stage, performers often use sheets 8 or 9 feet square. When folded four times, as has been described, a figure torn on either edge will appear eight times repeated in a circle when the paper is unfolded. By making another fold, the number of figures will be doubled, and the proportions will increase accordingly with every additional fold.

No entertainment with paper is really complete without "Jacob's Ladder," and besides being an entertaining stunt, it is one of the easiest effects in paper magic.

Do it like this: Take about 10 feet of ordinary wrapping paper, 18 inches wide, and fold a hem about ½ inch wide at one end of the paper. Then, beginning with this hem roll the paper up into a loose tube, leaving an open core of about 2 inches. When the roll is completed, slip a rubber band over each end to prevent it from unrolling. Flatten out the paper tube, and cut or tear out the center portion, as shown in Diagram A of Illustration 3, and then bend the ends downwards, as shown in Diagram B. The ladder is developed by holding the two ends in the left hand and pulling out the hem with the right. This unfolds the inner coils; and they should then be worked up, first one side and then the other, until the full ladder is developed,

The "Jacob's Ladder" is one of the easiest effects in paper magic.

as pictured in the photograph.

Many performers use various colored sheets of paper pasted together in this effect, and the result is quite pleasing. The size is immaterial . . . four feet or a veritable "ladder to heaven" . . . it's yours to command.

Another excellent trick with paper is the "Color Pocket." To make this, take a piece of stiff paper, about 6 inches square, and fold each of the four corners to the center, as indicated by the dotted lines in Figure 1 of Illustration 4. Then, turn the paper over and again fold the four corners to the center, producing a piece of paper like the one shown in Figure 2. Color the four triangles, A, A, A, A of Figure 2 with black paint, and, when dry, fold the paper in half to form Figure 3. Now, pinch the ends A, A, of Figure 3 and press them towards the center, forcing the sides B, B outwards so that the paper will form itself into the four-sided, diamond-shaped figure shown in Figure 4. You will find that there are four small pockets in the back of the completed fold. These should be opened up, and the thumb, and first, second and third fingers of the right hand inserted into them.

The whole effect is simply this: You show a paper pocket which is colored white. And then—Presto!—the pocket is colored black. The mode of doing this will be easily apparent if you take an actual model in your hand. By separating the fingers, either up or down, or across, you can open up the diamond-shaped figure to show either black or white as you desire.

Did you ever have some militant youngster rush up to you, all breathless, and demand with alert expectancy, "Make me a sojer's hat?" And could you do it? Well, here's the how. It's not the old paper hat that was worn ten years ago, but something decidedly different, with two perky cockades projecting from either side.

First of all, take a sheet of paper about 22 inches square and fold it diagonally from corner to corner in one direction, producing a piece of paper like that shown in Figure 1 of Illustration 5. Now, fold the corners A, A of Figure 1 up to the corner B, which will give you Figure 2. In Figure 2, fold down the top corners, A, A, as indicated by the dotted line, to form Figure 3, and

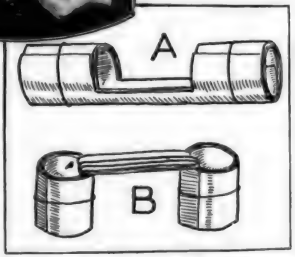


Illustration 3—Ten feet of ordinary wrapping paper is used in arranging the "Jacob's Ladder."

then fold these same corners out to form the cockades, as shown in Figure 4. Turn down the two upper corners of Figure 4, folding one thickness of paper to the front and one to the rear, as indicated by the dotted line, to produce Figure 5. In Figure 5, fold the back and front sides down again to complete the hat, which is shown "in action" in the photograph. Try it the next time somebody wants to be "Napoleon."

For another little paper stunt, take a strip of white tissue paper 1 inch wide by about 33 inches long and tie a single overhand knot in the paper about 15 inches from one end. This knot should be crushed flat.

After making the knot, fold and twist the short end of the strip about the knot to form the head of a paper man. After considerable practice a presentable paper man can be made and a soft lead pencil can be used for sketching details of the head. If you are somewhat of an artist, you can make this sketch very elaborate—an Abdel Krim, with beard, fierce eyes and a hooked nose—but if not, then simple straight lines for eyes, nose and mouth will serve the purpose quite nicely. The whole effect is absurdly simple, yet it should be practiced thoroughly so that you can make the necessary folds and twists.

In virtually all paper stunts crayons or water colors can be used to advantage in elaborating on the simple forms. The Jacobs Ladder can be given a different shade for every rung. The Mariner's Wheel spokes can be colored with nice effect. Excellent coloring can be done on soldier's hats and in keeping with the modern trend such hats can be given a futuristic or camouflage color design that greatly adds to the attractiveness of the finished article.

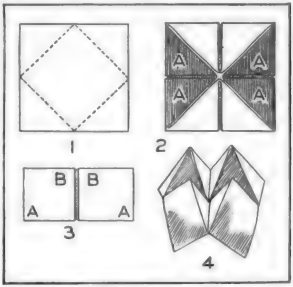


Illustration 4—The "Color pocket" is an excellent trick which can be used for illusion entertainment after it is completed from above diagram.

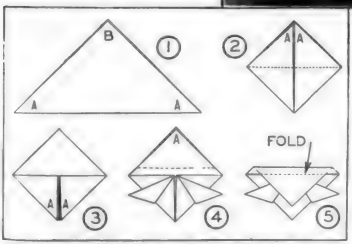


Illustration 5—This diagram shows folding necessary to make a "Soldier's hat" with cockades, as shown in photo.

The experimenter can derive a great deal of fun and decidedly entertaining paper stunts after he has made the articles described in this article. The person who becomes proficient in performing these tricks will find that it is rather easy but intriguing to fashion boats, following somewhat along the lines used in making paper soldier hats. One of the most fascinating of amateur stunts with paper is based on the folding indicated in the making of the "Mariner's Wheel." Many other intricate designs can be made.

Driven at close to 33 miles an hour by an Elto Quad, Miss Modern Mechanics is here shown going through trials on Lake Minnetonka. She can carry two heavy men with ease at this speed, and is a good, high sided, fast model.

BUILDING "Miss Modern Mechanics"

By HOWARD HOLBROOK

Speed! That's the cry today. Here's a hull capable of competing with the fastest of champions. You can build her yourself from the plans and instructions contained in Mr. Holbrook's story. This boat has actually been built by Modern Mechanics and is a proven, successful design which can be built for little money.

SINCE last month, when we began this article with the lines and planking instructions for the outboard speedster, "*Miss Modern Mechanics*" it has occurred to the writer that a few words on the peculiarities of the step hydroplane type of speed boat might clear away a few of the questions which might pop into the mind of the reader.

Some have asked what the step is for. The idea of the break in the bottom of racing boats was original with Mr. M. Fauber, a Frenchman who until his death recently, resided in New York. Mr. Fauber saw the then existing type of round bilged boat (1911) and decided that if the frames or cross sections were made flat, with a hard break, angle, chine or whatever you care to call it, and that if the boat had a break in the bottom, it would allow the boat to rise up on the surface of the water by eliminating the "cling" water which follows up the sides of the round bottom boat when it is driven at great speed. The friction thus eliminated would add to the boat's speed until, when it was on top, the step would cause further elimination of wetted surface by allowing the water to flow past the middle portion of the hull, supporting the stern by hydrokinetic energy instead of normal flotational buoyancy.

Thus was born the first hydroplane. The later usage of the word as denoting aircraft is a corruption of the older usage, and boats are more rightfully and properly called hydroplanes and aircraft hydroairplanes in well informed circles.

Miss Modern Mechanics thus, in conform-

ity with modern practice, has this step.

Now last month we were discussing the method of planking the hull. Off up to the right hand corner of the page you will see the cut of the bottom, taken from the bow. The slight curve given the seams in this shot is due to the straight edge of the planks taking a curve as they are twisted to conform to the V in the boat's bottom. The Garboard strakes (the strakes of planking next to the keel) are fastened in first. These are of ½-inch cedar and may be wide enough to put on in three or four strakes. The fewer strakes you use the easier the boat will be to plank, but if you use four strakes the boat will be less liable to fracture when jumping in waves. The pounding such a hull takes under the urge of the ten to sixteen horsepower outboard motor is considerable. Further, the narrower strakes will make a tighter boat, as the more strakes the less the action of the sun will tend to open the seams when the boat is hauled out of the water. In racing hydroplane circles it is the usual thing to take the boat out of the water when it is not being run so as to save it from soaking up weight in water.

Use Brass Screws

The planking is fastened to the ribbands or seam battens with ¾-inch brass screws. These are spaced about three to four inches and the holes must first be made with a small drill. Use a bit and brace screwdriver to drive the screws home. Be careful not to force them as the heads of the brass screw will easily part.

The bow and stern garboards are placed on first, the planks are put on left and right, or port and starboard as a boatbuilder would say, and then the topsides are started on as the boatbuilder shown in the photo on page 168 has done. In this photo the seam battens which back up the planks at the seams can plainly be seen, and the manner in which the first topside plank has been put on is also apparent.

The seams of the planks should be fairly tight on the inside edges and should taper or chamfer slightly on the outside. Say about 1/16-inch seam is left open. This is so that caulking cotton can be pushed into the seam with a broad dull chisel after the boat is planked, and so that white lead can be used to close the seam, making it water tight.

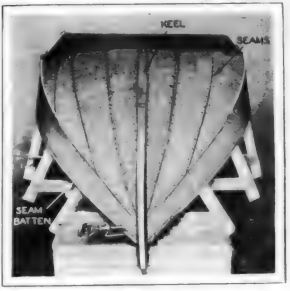
From a glance at the drawing on page 164 you will see just how the boat is framed. The relative positions of the chine pieces, the clamp, and the keel and stem can be checked against the construction cross sections shown in the blueprint on page 95 of the November issue. Each part shown in the drawing can be seen in the photograph with the exception of the deck framing. This is not necessary to build exactly as shown in the drawing. Any deck which suits your fancy will do. The arrangement plan shown is merely an approximation of styles set in recent successful boats. In *Miss Modern Mechanics* as she was built by the editors, a deck of paper, held in place by battens, was used. It served the purpose, but could not be walked on or wetted.

Canvas Deck Best

A deck of canvas stretched over the light frames indicated will serve as well as the ¼-inch planked decking as shown in the cross section blueprints, but it cannot be walked on. The purpose of the deck is to merely cover the boat against spray. Whatever weight can be saved is to the advantage of speed. Canvas, once the frames have been thoroughly fastened in to cross tie the hull, will make as good and as cheap a deck as one could wish if he is not particular.

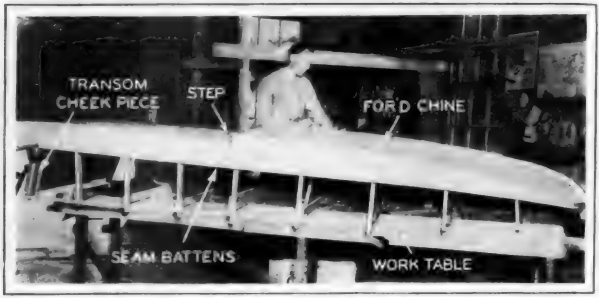
In fastening the planking the screws

Bow View Shows Bottom Planking



This shows the bow view of Miss Modern Mechanics in the shops of the Wayzata Boat Building Company, Wayzata, Minn., where she was built. Note the way the plank seams run, and how the seam battens back up the planking.

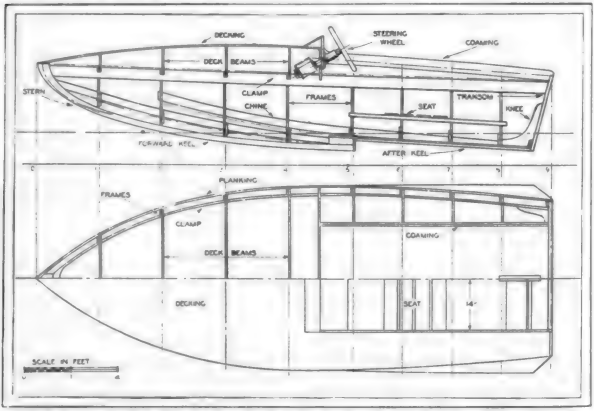
Construction of Frame and Method of Planking Shown in Photo Below



After the bottom has been planked the boat is well on the way to completion. The topsides are then planked. This photo shows still another step in the "building of the ship."

should be staggered, that is, not set opposite each other. They should be driven flush.

When the whole boat has been completely planked, it is sanded on the outside. A priming coat of gray is given all around, inside and out. This priming coat wants to be rich in oil and turpentine and drier, but short on pigment. When it is dry, the boat is ready to paint and launch.



Framed for solidity and long life is Miss Modern Mechanics, the profile construction plan and skeleton deck framing plan are here shown. The seating arrangement and the steering wheel are optional and are not needed for successful operation.

Driving Light Turns Automatically With Steering Wheel

A DRIVING light that turns automatically with your steering wheel is one of the newest conveniences for the motorist. It throws beams where they are most needed by the driver. The lights do not blind or glare because of the low location on the frame of car. The lights, adjustable to any angle, are connected to driving apparatus.

Front view showing a pair of driving lights clamped to car and connected with steering apparatus so they turn with every turn of the car.

Driving light automatically turned to left.

Identify Gems by Spectroscope

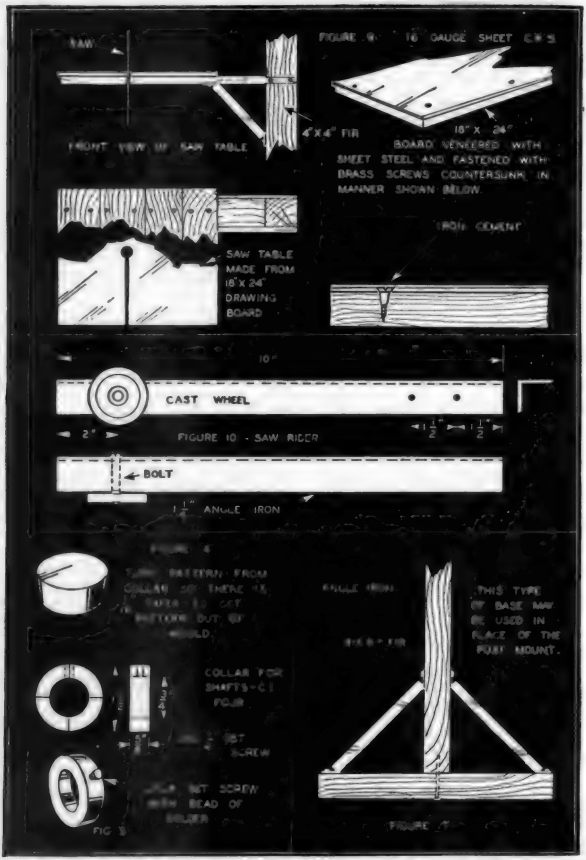
IDENTIFYING precious stones by means of the varied rainbow patterns they throw when examined under a "micro-spectroscope," may supplant the time-honored acid tests now employed by gem dealers. Dr. Edgar T. Wherry, of the U. S. Bureau of Chemistry and Soils, who has developed this unique test, explains that the identification is made by means of the very interesting phenomena revealed by the spectroscope. Light thrown by the gem is broken up into its component parts of red, orange, yellow, green, blue and violet, the colors being arranged in the order of their wave lengths as in the rainbow. The width of the color bands vary according to the mineral substance, and the black absorption bands between the colors likewise vary, both in width and intensity. A red stone, for example, might be glass, garnet, synthetic ruby, or ruby, worth from ten cents to two hundred dollars. The spectroscope, inserted in the eyepiece of a microscope, quickly analyzes the light from the stone, arranging the color bands and black absorption bands in a pattern that reveals the true composition without possibility of error, because the patterns for no two gems are alike.

Mammoth Camera for Advertising

A CAMERA as tall as a girl and mounted on wheels to facilitate moving was built as an advertising feature by a photographer of the Hague to win attention.

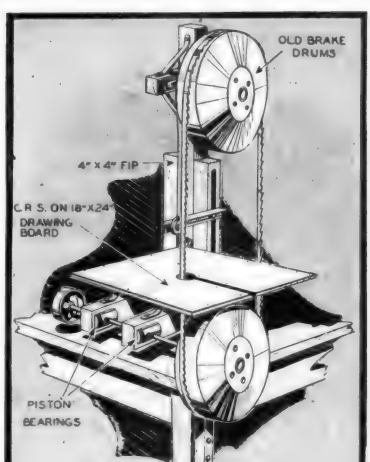
Camera as tall as this girl, mounted on wheels.

Simple Details of Ingenious Bandsaw You Can Easily Build at Home



Very simple are the details for the making of a bandsaw from used auto parts. The table in fig. 9 is made from a drawing board covered with metal; the other drawings are self explanatory.

From used brake drums, pistons and axles you can build a bandsaw which will rip, crosscut and outline material up to four inches thickness. Every well equipped home workshop can now have a serviceable, practicable home-built tool which will save much labor and do neat work in all classes of woodworking.



BUILDING a BANDSAW *from Old Auto Parts*

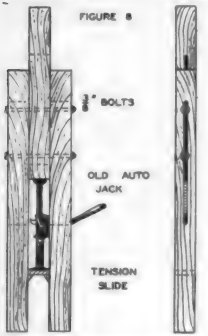
By T. S. ALLEN

THE power bandsaws you see in the shop windows along about Christmas time are the envy of every home workshop owner. Many of them are out of reach in price, though they all are fine tools. Of course, no shop mechanic will be without one if his shop is to be well equipped. Here's a way out of the difficulty: Why not build one?

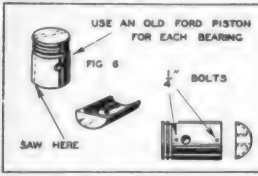
Using 4"x4" fir posts, an old auto jack for a tension adjustment, sawed off Ford axles, and old Ford pistons, you can make a fine little bandsaw which can be driven with the usual ¼ h.p. shop motor. The drums are 14-inch Cadillac brake drums. All the parts you can secure from the ordinary second hand motor supply companies which are to be found in any large city phone directory.

The saw shown will handle work up to 4" thickness and will take the usual saw furnished by any hardware dealer for a few dollars.

The most important part of the saw is the standard. This can be of the post type, or it can rest on the corner of your work bench. In the drawing above, to the pieces identified by the arrow leading from the



This is the jack post support.



From old Ford pistons the bearings are made, using the wrist pin holes.

tab marked 4"x4" fir, you will note two posts with slots in them in which another post has been fitted. The center post carries the stub shaft on which the top drum turns. This can be fitted any way to suit. No sketches of this detail are needed. The slots in the outside posts are for the tightening bolt to slide in. When the pressure on the saw has been taken up by the jack the bolts can be tightened.

By this simple means the adjustment of the saw can be made.

In fig. 9 you will see a piece marked 4"x4" fir. This is one of the uprights just mentioned. The saw table is fastened to the standard or upright at right angles. In this design it is not adjustable cantwise; to make it this way would complicate the design. It can be mounted according to the way the bearing cross posts come out below and according to the way your uprights are installed.

The adjustability for height of cut is made by the saw rider. This is shown clearly on page 171 in the tint cut, and also in figure 10. You will have to have a little wheel turned out to rest the back of the saw blade on so that sawing pressure can be applied without making the saw run off the drum. The rider can be slid up or down by the tension holding bolts and held in place by them.

The table top or sawing rest is a drawing board on which a flat, smooth piece of plumbers' cold rolled steel has been cemented with iron cement.

Instead of using a table to mount the saw on, leg bases can be made as per figure 7.

As shown in fig. 4 you will have to make a pattern for the collars. These are turned in cast iron and the finished product, in fig. 5, shows the rings which are used to take the thrust on the shaft and keep it in line.

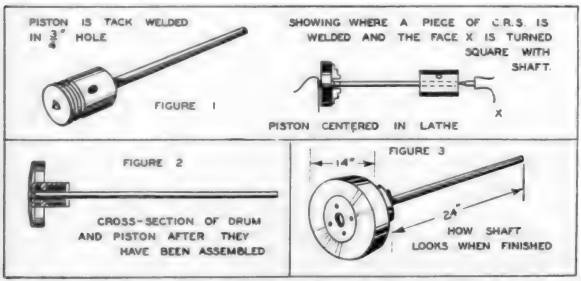
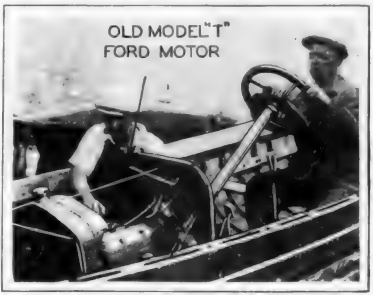


Fig. 1 shows how the shaft is welded to a piston so that the drum can be welded to the piston head, as shown in fig. 2. The 14-inch brake drums and shaft are trued in a lathe.

Old Model Ford Motor Converted Into a Seagoin' Flivver

WITH very few changes an old Model T Ford motor can be converted into a marine engine, hooked up with a propeller shaft and made to drive a rowboat. Bob Reardon, a bell diver, and Tom Riley, an automobile mechanic and sailor, are responsible for the motor boat creation pictured at the right, which they claim will make as good time as any boat of the same class on Lake Michigan where they launched their seagoin' flivver. They utilize virtually the entire Ford engine, retaining even the instrument board and steering gear, the only changes pertaining to its attachment to a propeller shaft. The boat is shown on Lake Michigan almost set for a shift into low to plow for the high seas.



Ancient Ford motor drives propeller shaft of this lake boat.

"Skip Distance" a Radio Mystery

TO MANY uninitiated to the mystery of radio the phenomenon known as "skip distance" is most puzzling. The layman might reasonably assume that the closer one is to a broadcast station the stronger the signals received. That is largely true with ordinary longwave stations but with a short-wave transmitter the situation changes. For instance a short-wave transmitter in New York operating on less power than is ordinarily used by long-wave stations may be picked up in Australia but not be picked up at all by receivers less than 500 miles from the transmitter.

Electric Tortures Devised

TORTURE by electricity is reported to be the latest crime-detecting device of the new government police in China. Chinese courts have long recognized torture as a legitimate means of inducing reluctant witnesses to speak. The victim is stretched out full length on a frame of bamboo and tied there, with his hands crossed on his chest and fastened to the terminals of the electric machine. The current is then turned on and produces such unbearable agony that the partially electrocuted victim instantly promises anything whatsoever or confesses any secret that he knows. The treatment is claimed by the Chinese electricians not to be dangerous to life and not to produce mutilation or permanent injury resulting from torture methods less scientific.

Bicycle Rowboat Speeds Forward Under Both Hand and Foot Power

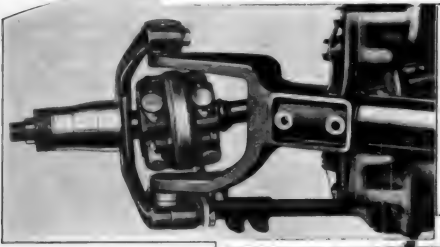
Fred Kurth powered the boat shown with an old bicycle.

AN OLD bicycle was used for the major part of this unique hand and foot operated power plant for a rowboat invented by Fred Kurth and tried out on a lake in Central Park, New York City. The bike frame was tilted up on end and a drive gear attached to the front axle so that the pilot-engineer can use his hands and feet in driving the propeller.

Unusual Features of the New Front Wheel Drive Auto

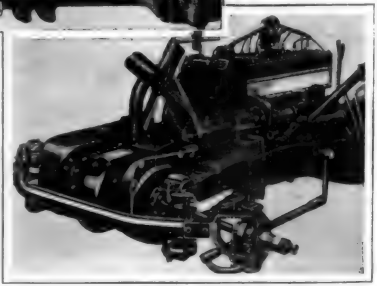
Cord car has gear shift on dash board; new type universal joint.

The big round shield at the front of the new Cord front-wheel-drive car is one of its chief distinguishing marks on the road, the shield covering the front transmission and differential and forming a background for the front license plate.

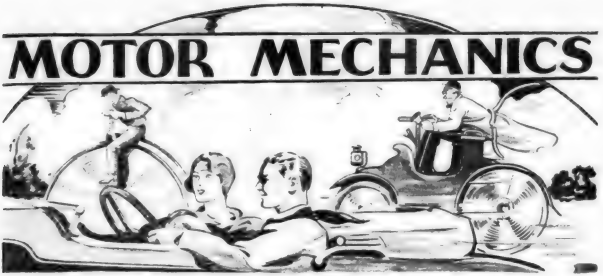


Above is the handsome instrument board of the Cord car, in keeping with all of the fine interior appointments of the car. The knob just to the right of the center operates the gear shift, the customary gear shift lever being eliminated.

The sensational universal joint shown above which makes the front wheel drive possible amounts practically to two ordinary ones, set at a 45-degree angle to each other. The ordinary joint has four equidistant breaking points. By setting one so its breaking points come halfway between the breaking points of the other, eight points are achieved and the shaft can revolve without grabbing at an hitherto impossible angle. At right is three-quarters view of the front end of chassis of the Cord, showing position of motor, transmission, differential, front axles, brake drums and universal joints. Note battery is behind the fan.



MOTOR MECHANICS



Edited by RAY F. KUNS

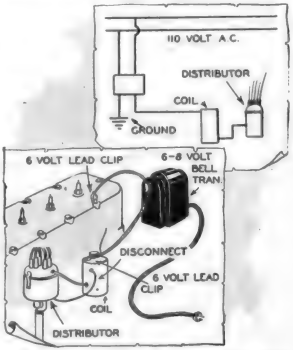
Mr. Kuns, editor of this department, is principal of the Automotive Trade School of Cincinnati, Ohio, and a nationally known expert in his field. He is also editor of the Automobile Digest, national auto trade journal. This department of motor hints is a regular monthly feature of Modern Mechanics magazine.

Bell-Ringing Transformer Starts Car With Weak Battery

WINTER weather brings its troubles to the car owner, among them being run down or weak starting batteries that will not turn the motor over when temperatures are low and engine oil is stiff. This annoyance can easily be overcome by using a bell-ringing transformer fed from the electric lines which light the garage. By its use a satisfactory spark for quick starting is obtained even though the battery is practically dead. After the motor is started and warmed up the transformer can be disconnected and the work continued by the car battery if the motor is blanketed to retain some of the warmth created by runs during the day.

Attach a 6-8 volt bell-ringing transformer to the garage wall with a receptacle so situated that the transformer can be plugged in at will. Fit the output terminals with long, flexible leads which will be able to reach the car any place in the garage. These leads should be fitted with spring clips.

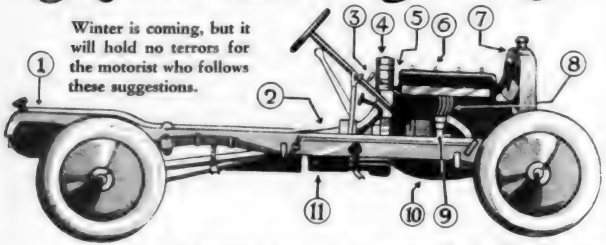
When the starting battery fails and the services of the transformer are required, disconnect the lead from the distributor to the spark coil of the car as indicated in the drawing. Then clip one transformer lead to the coil terminal and the other to any convenient ground, such as the cylinder block bolt head. A few turns on the crank will usually be sufficient to start the motor. Let the motor run for five minutes until it is well warmed up. Then disconnect the transformer, replace the motor connections as usual, and the warm motor can be started from the battery, which will have been pepped up by the few minutes' running. This is a handy trick to know and its use will save much annoyance.



Details of the hook-up of the transformer which supplies current to cold motors when the battery runs down are given in the drawing above.

How to Start Your Car

Winter is coming, but it will hold no terrors for the motorist who follows these suggestions.



Figures refer to chassis parts whose operation is affected by cold weather.

DRIVING a motor car in cold weather will be made much easier if the motorist will observe a few simple precautions as outlined below. It is easy to exhaust a battery trying to start a cold engine, and then the only remedy is to have the battery recharged or get another motorist to tow you until a starting spark is obtained from the generator. Follow the hints below and winter will hold no driving terrors for you.

1. Gasoline

Fill the tank with a volatile or "high test" fuel. Special gasolines containing ethyl or benzol enrich the mixture in the cylinders, as these volatile compounds vaporize even when the temperature is down to zero.

2. Winter Grease

Transmission and differential should be cleaned and refilled with grease of lighter consistency than is used in summer. This permits easy shifting of gears and insures complete lubrication of moving parts which otherwise are likely to cut channels through the stiff grease with consequent lack of lubrication.

3. Starting Mixtures

Be sure the choke is operating properly. Pulling out the choke rod cuts off the air supply from the carburetor and permits raw gasoline to enter the cylinders where it is split into small particles and mixed with air in proportions which make it easy to ignite. A pint of commercial ether is a good starting aid, and this quantity will last all winter. To use ether, inject a small quantity through the spark plug openings, or place an ether-saturated cloth at the intake of the carburetor.

4. Fuel Line

Keep the vacuum tank free from water and dirt. It is important that water be kept out of the fuel lines, since if it freezes the motor will receive no gasoline from the tank.

5. Carburetor

For winter starting it is desirable to have the needle valve of the carburetor opened wider, as the gasoline used in priming with the choke is drawn from the carburetor float bowl, and the wider opening permits more fuel to be carried into the cylinders.

Heat applied to the carburetor in any safe form will facilitate starting. An ordinary brick heated in an oven and placed in the engine pan adjacent to the carburetor is used by many motorists. An electric heater or iron plugged into the lighting circuit and placed under the hood will eliminate much starting difficulty. Pouring hot water over the carburetor and manifold also helps, but a better method is to wrap a cloth around the manifold and pour the hot water slowly over this, having part of the cloth well against the carburetor.

6. Spark Plugs

Spark plugs often oil up and foul in winter due to missing, and even though the car

Easily in Cold Weather

has been driven only a few miles the removal of plugs will show some oil deposits. Wipe this off carefully, making sure the porcelains are not cracked and the plug points are set not more than 1/32-inch apart.

7. Cooling System

Flush out the radiator so that rust and scale is removed. If you use alcohol as an anti-freeze, fill the radiator with a 50% solution, which is sufficient to protect against any sub-zero temperature you are likely to encounter. Then when the level of the radiator liquid falls low, do not add more water. Simply put in the necessary quantity of alcohol, and you are sure your mixture will remain as strong as when originally filled. If you use glycerin, be sure all connections are tight to prevent loss by seepage. Some commercial anti-freeze products affect the motor and cooling systems unfavorably, so investigate the merits of anything you put into the radiator.

8. Ignition

If any ignition wires are covered with cotton over rubber, shellac them as protection against water saturation. Snow drifting in and muddy water splashed on the engine by the wheels is likely to saturate unprotected wires, with the result that the current will lead to the nearest ground. The induction coil also is affected by moisture. If the coil is placed where melting snow reaches it through the hood hinges, it should be covered with a rubber sleeve.

9. Distributor

Gummed oil will interfere with the breaker mechanism in the distributor. Clear out all gummy oil with kerosene and use only light grade oil, preferably generator or typewriter oil. Clean the path of the rotor of all dirt and metal particles, so that the rotor can make complete contact.

10. Engine

Free turning of the engine is essential to easy starting. Drain out the old summer oil, flush out and refill with a good grade of cold weather oil. Use only the best quality. This flushing out should be repeated at least each thousand miles because of the sludge of water and gasoline which accumulates. Clean oil is assurance that the engine will be turned over at high speed by the starter, or if cranked by hand permits a snappy swing that draws in the mixture, compresses and fires it before the gasoline can settle on the cold metal in the chamber. The cleaning of the carbon and grinding valves are obviously part of the preparation for winter driving.

11. Battery

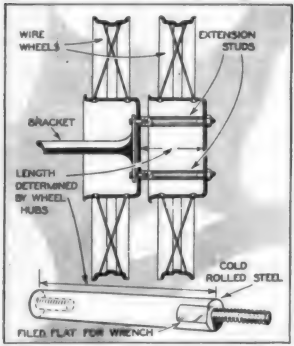
Perhaps the most vital feature of winter driving is proper care of the battery. This unit is used more in winter than any other season, just when its efficiency is lowest. Drives are short, starts are frequent, and the long nights require more use of the lights. Stiff oil in the engine requires excess current to turn over the motor. Every effort should be made to conserve the battery charge. Cut out the momentary stops of the engine, burn dim lights where practical, use an auxiliary oil light for parking and build up the battery charge by adjusting the generator to a higher charging rate. Make as many long trips with the car as possible. Check the condition of the battery periodically; a run down battery freezes easily and is ruined.

A favorite stunt in cranking Model T Fords in cold weather is to jack up one rear wheel. This permits the rear wheel to turn with the crank, making cranking easier than if the planetary transmission were forced to revolve in congealed oil.

New Cars Delivered From Factory to Dealer by Trucks

SPECIAL trucks capable of carrying up to half a dozen cars are now extensively used by the automobile manufacturers in delivering their product to dealers. The photo above shows a typical truck with a load of four new cars. Another popular style of truck accommodates six cars which stand on a trailer at an angle of 45 degrees, thus saving space. This method of delivery is used when hauls do not exceed a few hundred miles, or when shipments are made by water to large distributing centers and thence delivered to dealers. A large saving in costs is effected.

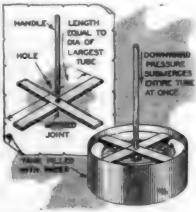
Three Extension Studs Clamp Extra Wire Wheel to Auto Tire Carrier



POPULARITY of wire wheels of the demountable type is evident from a casual study of latest model cars. One complete spare wheel is usually provided with the car, but many motorists prefer to carry two wheels for long trips to make sure it won't be necessary to stop and patch a tire. A simple means of carrying an extra wheel is shown in the drawing at the left. Any machine shop will make you three extension-like studs with threaded ends and tapped recesses, to fit the bolts and nuts on the tire carrier. The sides of the studs are flat on one end to provide a grip for a wrench in removing them. Cold rolled steel is used for the studs. The method as shown is simple and sturdy enough to stand up under hard usage.

Improved Inner Tube Puncture Testing Outfit

INNER tube punctures are usually tested by immersing the tube in water, bubbles indicating the point of damage. Usually, however, only part of the tube can be immersed at one time and the puncture may be missed. The simple home-made device shown at right does away with this difficulty. Provide a shallow tub; cross two pieces of wood at right angles, apply a broom handle as shown, and the device will submerge the entire tube at once.



WHOOPEE on Wheels!

WHOOPEE that's healthful — motorcycling, sport of a thousand thrills!

Whirling wheels on a winding road—motor that purrs when it's working hard, and whispers at racing speed!

Ride away on a "45" Twin, 1930 model, and revel in motorcycling at its best. On long tour or short ride, you'll enjoy every mile — and the miles will cost you almost nothing.

Your dealer wants to show you the 1930 models. See him today—ask about his Pay-As-You-Ride Plan.

6 Important Improvements for 1930

HARLEY-DAVIDSON
Motorcycles

Mail this Coupon! —for literature showing our Singles and Twins for 1930.

HARLEY-DAVIDSON MOTOR CO., Dept. MM., Milwaukee, Wis.
Interested in your motorcycles. Send literature.

Name . . . . . .

Address . . . . . .

My age is ☐ 12-15 years ☐ 16-19 years ☐ 20-30 years ☐ 31 years and up. Check your age group.

LUMINOUS PAINT

Make Your Watches, Clocks, Etc., Visible by Night The very latest discovery in the scientific world. Hitherto practically unknown. Ask almost at an exorbitant price, we have at last succeeded in producing this remarkable LUMINOUS PAINT which, applied to the surface of any article, gives it a clear light, however, a perfectly visible in the dark. THIS DARKEN THE NIGHT. THE LIGHT WILL LAST 12 HOURS. Quite enough to enable you to tell the time by night. Just a touch of your watch or clock will enable you to tell the time by night. You can make the most beautiful designs on your walls, ceilings, etc., which will look like stars. Also make your own luminous signs, etc. Sufficient to cover 2 sq. ins., 10c; 6 sq. ins., 25c and 50 sq. ins., 50c and $1 prepaid. JOHNSON SMITH & CO., Dept. 688 RACINE, WIS.

CIGARETTE MAKER

Roll your own and save money. Better and purer than ready made. Use your favorite brand of tobacco. Fine, Neat, useful, handy. Makes perfect cigarette. Holds standard size paper. Price, 3 for 10c.

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Very striking, genuine, real Tiger Eye. Stone mounted in massive, heavy, gold plated ring. Stone is cut of the very finest quality and is guaranteed perfect. Ring comes in a variety of sizes. Price 50c, postpaid.

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JUST LIKE ORDINARY CIGARETTES, BUT WHEN STARTED TO SMOKE! Looks and tastes like a real cigarette of excellent quality. Will explode at or near, but when each cigarette is about two-thirds smoked, the fuse will ignite a very small quantity of powder which will cause a loud BANG! Price 10c, 3 for 25c, prepaid; or postpaid by mail, 50c per dozen.

NOVELTY BADGES

Flashing Pencil Pin *Garter Inspector Pin*

Very new, novel metal badges, highly nickel plated, with safety pin attached. Size of pin about 1½ inches. Each one is put up in a separate envelope, ready for mailing. Price, 10c each, postpaid.

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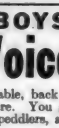
GREAT CURIOSITY IN MINIATURE. Is the World. Size of one of the 365 pages, 2½ x 3½ inches. Printed in large, clear type. Bound in genuine leather and contains the entire New Testament. Make good reading matter. Price, postpaid, 10c. Large Family Bible, 1,200 pages, 4½ x 6½ inches. Price, $1.00, postpaid

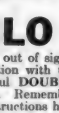
BOYS! BOYS! BOYS!

Throw Your Voice



Into a trunk, under the bed, under a table, back of the door, into a desk at school, or anywhere. You get lots of fun fooling the teacher, policemen, peddlers, and surprise and fool all your friends besides.

THE VENTRILO



is a little instrument that fits in the mouth out of sight. Cannot be detected. It is used in connection with the above, and with the aid of this wonderful **DOUBLE THROAT**, or **VENTRILO**, you can imitate many kinds of animals, etc. Remember you get everything for **ONLY TEN CENTS**—a booklet giving you full instructions how to become a ventriloquist and throw your voice, the **Double Throat**, or **Ventrilo**, and our big 600 page catalog of novelties, tricks, puzzles, masks, books, etc., **ALL SENT POSTPAID TO ANY ADDRESS FOR ONLY 10 cents**

MEXICAN JUMPING BEANS

Scientists are unable to give a reasonable explanation for what purpose nature created these curious **Jumping Beans.** They are found growing on small trees in the high mountainous regions of Mexico. The Beans **Wiggle, Move, Jump, Flop Over, Etc.** It is amazing to keep up this endless activity. Send for a few of these great curiosities. **Three Sample Beans sent for 25c, 12 for 75c, or One Gross (144) for $7.50 Postpaid.**

MAGICIAN'S BOX OF TRICKS

Apparatus and Directions for a Number of Mysterious Tricks, Enough for an Entire Evening's Entertainment $1.00

ANYONE CAN DO THEM

It is great fun mystifying your friends. Get this Conjurer's Cabinet, and you will be the most popular boy in your district. It contains the apparatus for ten first-class tricks, including The MAGIC RED INDIAN TANK TRICK (a wooden tank is placed inside, and upon removing the lid, the Indian has vanished); The MAGIC WAND pocket; the HINDOO TRICK CARDS (can be made to change color, print or no time limit); DISAPPEARING COIN BOX (a coin, placed in the wooden box, vanishes entirely or reappears in one of another denomination); The GLASS GOB-LET TRICK (a coin is dropped into a glass of water and when the water is poured out the coin has vanished and is found somewhere else); The RIBBON FACSIMILE TRICK (a piece of colored paper ribbon passes through the solid); the DISAPPEARING HANDKERCHIEF (a handkerchief is placed in the hand mysteriously vanished; the WIZARD'S RING COIN TRICK; the ENCHANTED BOTTLE (one bet yourself is able to make it up down); the GREAT HAT AND DICE TRICK (a large dice is placed on top of a hat, disappears, and is found underneath; yet no one has touched the hat); and last, but not least, the GREAT PHANTOM CARD TRICK, or two from five leaves nothing. Full instructions are given for performing each trick. Many other tricks can be performed with the apparatus are fully explained. Each one can easily make or procure all the necessary articles. Price complete $1.00 postpaid.** JOHNSON SMITH & CO.

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It goes with real Yankee Pep—by its own power

Most remarkable toy ever invented. By drawing the Tank backward, together with the hand or over the face or table top, the engine is driven. A real steel skeleton, overcoming friction in the same like manner as the large tanks of the battlefield. What makes it go is somewhat of a mystery, for there is no explanation to wind up as is usually employed with toy mechanical

toys, yet this tank will keep plodding along ten times longer than the ordinary run of toys. It will overcome the most unlevel surface. Price, postpaid, only 25c prepaid. Stamps accepted.

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Great curiosity. Place in water, and starts to grow in two minutes. Taken up and starts to grow in few minutes. Taken out it dries up and goes to sleep until put in water again. Price, 10c, 2 for 25c, 75c dozen, postpaid.

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Uses Potato for Ammunition

NEW

This is surely the most ingenious of all air pistols. For ammunition, *A POTATO IS AN ORDINARY POTATO*, and that isn't hard to get. Merely the point of the barrel of the pistol into a potato, as shown in the illustration, withdraw the pistol and fire. Nothing could be simpler. It fires quite a distance, goes off with a report like all air guns, and there is absolutely no danger. Well constructed, made entirely of metal. Price Postpaid, Only 25c.

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An excellent little book containing 250 Parlor Tricks, tricks with cards, coins, handkerchiefs, eggs, rings, glasses, etc. So simple that a child can perform them. Profusely illus. Send postpaid to any address for only 10c., 3 copies for 25c.

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Lots of harmless fun and amusement wearing these rings. Made in platinoid finish (so resemble platinum), with wording on enameled, as illustrated. **Price only 25c Postpaid.**

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A great trick by which you can apparently breathe fire from mouth, to the horror and consternation of all. Quite harmless. All apparatus necessary sent complete in box for **ONLY 25c. P. S. et. JOHNSON SMITH**

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25c

A REAL STARTLER. This is the most popular of all squirt tricks. The flower in your coat looks as fresh and sweet that everyone is tempted to inhale the delicate perfume. But, instead, the smell is gone but the bulb, concealed in the palm of the hand, squirts a powerful stream of water. The little thief easily reaches to the pocket of your coat or trousers, and the bulb is large enough to make a dozen shots with one loading. **PRICE 25c, each, or 2 for 40c postpaid.**

SEEBACKROSCOPE

Please this clever instrument to your eye, you see what is behind your back. Very interesting. Disappointment never when no one thinks you are looking. Just like having eyes at the back of your head.

PRICE 25c Postpaid

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A perfect little typewriter for $1.50. There are no mechanical persons the world has as low a typewriter. Human minds and hearts do not write with such ease and speed as with the practical use of a $10 or $20 up-to-date dollar machine. To such persons we recommend the "Little Giant." It is strongly made, but simple in construction, so that anyone may quickly learn to operate it, and write as rapidly as they would with a pen and ink. Any letters, figures, characters and signs can be written on the paper. With this machine you can write a letter or manuscript as fast as you can think, and the work is always neat and legible. Will do the work of a $10 or $20 typewriter. Just the thing for your boss girl typewritten love letters, address envelopes, make out bills, and do almost any kind of work not requiring a large, expensive machine. With each machine we send a tube of ink and full printed instructions for using the machine. Price complete $1.50 by mail postpaid to any address in the world.

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B. S. DEGREE IN 3 YEARS

Complete, Practical Electrical Education

Learn by the thorough, approved scientific methods which our 26 years of specializing enable us to give you. In addition to Electrical Engineering, the following complete courses are given: **A. C. and D. C. Armature Winding—Wiring and Testing—Commercial Electrical Engineering—Automotive Electricity—Radio Sales Service and Broadcasting—Electrical Refrigeration.**

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Cooperation with large Milwaukee Electrical industries enables us to help place students in part time jobs to help their way while learning. Low tuition. Board and room reasonable. Daily broadcasting. School orchestra. Fraternities.

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Bore 1½", Stroke 1½". Weighs only Two Lbs. Miniature Spark Plugs, New Multi-jet Carburetor, Air or Water Cooled. Scientifically designed and easy to build in your own workshop. Do not confuse WALL ENGINES with others of similar design but of inferior make. WALL ENGINES are 20 years old and are the largest line of Model Gasoline Engines in the World.

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Let Me Make YOU OVER!

Big Muscles Quick!

LOOK at those two pictures! Which are YOU? A puny run-down weakling, scorned by your fellow-men, avoided by the fair sex, ashamed to show yourself in a bathing suit? Snap out of it, friend! Take a look at that big boy at the right and cheer up. That's the way TITUS builds men. And YOU'RE NEXT.

It's So EASY to Be Strong

Just give me 30 days and see the amazing change. New health—new strength—new energy—all in a few minutes a day! Why be a weakling when it's so EASY to be strong? One man writes me: "I never put on muscles so fast in all my life!" Another says: "I never thought that I could ever improve like I have." Still another writes that muscles "seem to grow overnight." Hundreds of letters like these PROVE that you, too, can be strong. Remember, I don't just promise you muscles, I GUARANTEE them.

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I'm going to broaden your shoulders and fill out your chest. I'm going to build layers of powerful muscles. Not beef, not lumps of lead—but beautiful long rippling muscles that are ALIVE with speed and strength—PANTHER muscles! Just watch those mighty sinews GROW—on your arms, your legs, your back. I'm going to develop EVERY muscle in your body. And I'll not only work on you **outside**, but **inside**, too. I'll strengthen your internal organs, fill you full of glorious pep and energy. Man, you'll feel like shouting for the sheer joy of living. Shoot that coupon to me TODAY. Get your FREE copy of my big book "Miracles in Muscles." It's filled with Titus's own secrets for making muscles grow!

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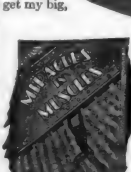
853 Broadway
NEW YORK CITY



WEAR THIS MEDAL

Strong men all over the world wear it as a badge of manhood. Made of solid statuary bronze and given to you free.

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Dear Titus: Okay, send that wonderful, big illustrated book of yours, "MIRACLES IN MUSCLES." Get it to me by return mail, without the slightest cost or obligation on my part.

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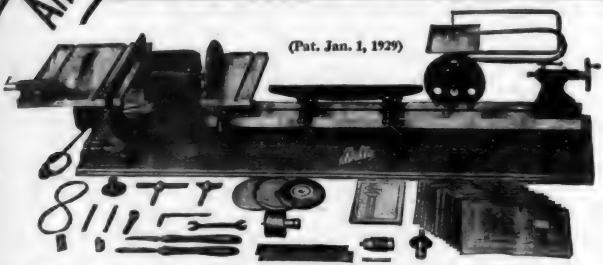
Announcing—

The NEW 1930 Models

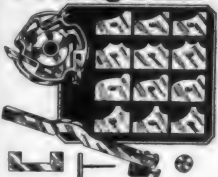


(Pat. Jan. 1, 1929)

"Delta" Electric Handi-Shop

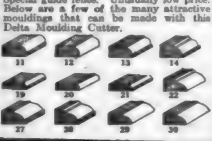
A complete motorized workshop for craftsmen including all necessary equipment for Circular Sawing, Wood Turning, Scroll Sawing, Sanding, Drilling, Grinding and Buffing. Full instructions and blue prints furnished.

New "DELTA" Moulding Cutter



Cuts Over 50 Moulding Shapes With Only 4 Sets of Blades

Interchangeable high speed blades produce over 10,000 cuts per minute at 3500 RPM. Blades require no individual adjustment. Quickly and easily locked in position. Special guide fence. Unusually low price. Below are a few of the many attractive mouldings that can be made with this Delta Moulding Cutter.



Practical Design—Dependable Quality *Plus* Many Exclusive Features

that's what you find in every woodworking unit bearing the Delta trademark. Craftsmen, artisans, farmers, mechanics—all who use wood in their daily labors or spare-time hobbies—are delighted with the sturdy construction, splendid efficiency and **moderate** cost of Delta equipment. They appreciate keenly such practical constructional features in the Handi-Shop as:

1. **Two-shaft motor that permits carrying on two important operations at one time without continually dismantling set-up.**
2. **Heavy U-shaped Lathe Bed (no rods) guaranteed not to chatter.**
3. **Automatically Oiled Bronze Bearings.**
4. **Patented Tilting-Tables.**
5. **Circular-Saw Raising lever.**
6. **Absence of interference when sawing large pieces of lumber; and many other important improvements found only in Delta products.**

10-DAY TRIAL EASY TERMS

For complete details and full description of the new 1930 Delta line, send coupon for FREE illustrated literature. You will learn also how you can try any Delta equipment for 10 days under actual working conditions at our risk. Your choice of three convenient payment plans. Mail coupon on opposite page today. It describes numerous items of interest to those who work with wood.

Delta SPECIALTY CO.

Delta Woodworking Units
for HOME CRAFTSMEN, FACTORIES, SHOPS, CONTRACTORS AND FARMERS

The introduction of the Delta Jointer and Circular Saw Units marks a new era in moderate-priced woodworking equipment. Now, for the first time, are available sturdy, practical machines in compact, convenient form at price levels astonishingly low. The new Delta Units include:

Combination 4-Inch Jointer 8-Inch Circular Saw Motor Driven

A convenient, efficient combination. Permits sawing, rising, and smoothing in one quick operation. Both Jointer and Circular Saw are run from the same motor with separate belts. Neither Unit interferes with other. Can be operated together or separately. Mounted on sturdy welded steel stand of convenient height. A rugged portable outfit at an attractive low price. Furnished with or without motor as desired.

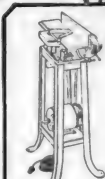
4-Inch Jointer Unit

Consists of new Delta 4-inch Jointer mounted on separate welded steel stand. Produces smoothly finished work in surprisingly short time. Built to give years of satisfactory dependable service on production work. Incorporates numerous exclusive features such as Self-Aligning Fence with accurate graduations permitting fence to be set quickly at any angle from 0°–45°; Fool-proof guard; Automatically-oiled bronze bearings; Non-slipping V-belt drive. Furnished with or without motor.

8-Inch Circular Saw Unit

Consists of new Delta 8-inch circular saw on gracefully designed welded steel stand. Practical design and sturdy construction make it ideal for steady production work. Has Automatically-oiled bronze bearings; Patented tilting table; practical Miter-gage and Rip gage; Raising and Lowering Crank Screw permitting micrometer-like adjustment; V-belt drive. Furnished with or without motor.

"DELTA" Means Quality in Every Detail



4-Inch Jointer Unit

8-Inch Circular Saw Unit

Send coupon today for FREE Illustrated Literature showing many items of interest to those who work with wood.

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Please send me without obligation, FREE illustrated literature showing new 1930 Delta line. Also full details of your 10 day trial offer and easy terms.

(Check proper square)
☐ I am particularly interested in Delta Electric Handi-Shop.
☐ I am interested in new Delta Woodworking Units.

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Big Stage Illusions Secrets of the Orient

Master Illusions from Europe, India, China, Japan. Guarded secrets of the Orient—over 250 tricks from small effects to Big Stage Illusions, with nearly 3000 illustrations, that and more is what you get in the Tarbell Course in Magic!

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The first and only Course in Magic ever offered to the public teaching *real professional Magic!*

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You need not give up your job. You can make also money entertaining on the side as a semi-professional, or if you want to, you can become a Big Magician, make big money, enjoy fame and glory.

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Tell me about Dr. Tarbell's new and simple system by which I can learn the secrets of MAGIC. Also tell me about your Low Price and Easy Terms Offer. No obligation on my part.

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Foremen!

Increase Your Pay

No matter how many years you've been on the job, you'll find LaSalle home-study training in Modern Foremanship a real money-maker for you. Here's why: Right after the war, Hugo Diemer, Master Mechanic and a member of other experts who had won distinction in the field of production engineering, undertook to gather, analyze and organize for LaSalle the experience of *more than 5,000 practical foremen and production men in every line of industry.* Upon this basic material they built a 12-volume remarkable training course covering every phase of the foreman's job. "Have received two promotions and a raise" in salary of $9 a month"—"Have increased the production of my department 10%"—"My monthly salary is now $150"—"Raise of $25 a month"—these are but a few of the many tributes paid LaSalle home-study training in Modern Foremanship. Low cost; easy terms. Complete details in an attractive 48-page book, "Modern Foremanship," sent you free upon request. Write for it today.

LaSalle Extension University, Dept. 1103-MF, Chicago

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—Every Deaf Person Knows That

I make them hear. I offer nothing dead (or 25 years, with these Artificial Ear Drums. I wear them day and night. They are unseen and thrilling users. They stand for my character. Let me prove them. Write me and I will tell you a true story, how I got deaf and how I can help you hear. Address

Dedicated Ear Drum

GEO. P. WAY, Artificial Ear Drum Co. (Inc.)
34 Hoffman Bldg., Detroit, Mich.

Start with WIRING

—the first step toward a good job in ELECTRICITY

The sensible way to "break into" Electricity is to learn WIRING. Start with WIRING but don't stop when you're an Electrician. From time to time you can learn motors and generators, electrical drafting, power stations equipment, radio, or other advanced subjects. Plan to learn one thing at a time and to *advance one step at a time*, until you're at the top of this money-making business.

If you are interested in getting into Electricity—right, send for Free "Unit Plan" book.

Unit Plan Book FREE

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AMERICAN SCHOOL, Dept. E-893 Drexel Ave. at 58th St., Chicago

Please send free Unit Plan Book, and tell me all about WIRING and other low-cost, quick Electrical Units of home training.

Name.....

Address.....

...but when I started to play the laugh was on them!

"WELL, folks, I guess we'll have to lock up the piano and make faces at ourselves."

Helen Parker's party was starting out more like a funeral than a good time.

"Isn't Betty Knowles coming?" an anxious voice sang out.

"Unfortunately, Betty is quite ill tonight and Chet Nichols is late as usual," replied Helen gloomily.

"I know some brand new card tricks," volunteered Harry Walsh.

"Great!" said Helen. "I'll go and find some cards."

While she was gone I quietly stepped up to the piano bench, sat down, and started to fumble with the pedals underneath. Someone spotted me. Then the wise-cracks began.

They Poke Fun at Me

"Ha! Ha! Ted thinks that's a player-piano," chuckled one of the boys.

"This is going to be a real musical comedy," added one of the fair sex.

I was glad I gave them that impression. So I kept fiddling around the pedals—making believe that I was hunting for the foot pumps.

"Come over to my home some night," said Harry. "I've got an electric player and you can play it to your heart's content. And I just bought a couple of new rolls. One is a medley of Victor Herbert's compositions—the other . . . ."

Before he had a chance to finish I swung into the strains of the sentimental "Gypsy Love Song." The joking suddenly ceased. It was evident that I had taken them by surprise. What a treat it was to have people listening to me perform. I continued with "Kiss Me Again" and other popular selections of Victor Herbert. Soon I had the crowd singing and dancing and finally they started to bombard me with questions . . . "How? . . . When? Where . . . . did you ever learn to play?" came from all sides.

I Taught Myself

Naturally, they didn't believe me when I told them I had learned to play at home and without a teacher. But I laughed myself when I first read about the U. S. School of Music and their unique method for learning music.

"Weren't you taking a big risk, Ted?" asked Helen.

"None at all" I replied. "For the very first thing I did was to send for a Free Demonstration Lesson. When it came and I saw how easy it was to learn without a teacher I sent for the complete course. What pleased me so was the fact that I was playing simple tunes by *note* from the very start. For I found it easy as ABC to follow the clear print and picture instructions that came with each lesson. Now I play several classics by note and most all of the popular music. Believe me there's a real thrill in being able to play a musical instrument."

Which Instrument Do You Want to Play?

Piano	Saxophone
Violin	Trombone
Guitar	Harp
Clarinet	Piccolo
Ukulele	Mandolin
Flute	Cello
Cornet	'Cello
Hawaiian Steel Guitar	
Sight Singing	
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Banjo (Plectrum, 5-String or Tenor)	
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This story is typical. The amazing success of the men, women and children who take the U. S. School of Music course is largely due to a newly perfected method that makes reading and playing music — *actually simple!*

Even if you don't know one note from another now, you can easily grasp each clear, inspiring lesson of this surprising course. You can't go wrong. First you are *told* how a thing is done, then a picture *shows* you how, then you do it yourself and *hear* it.

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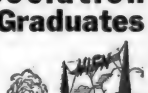

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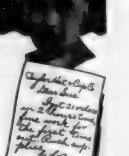

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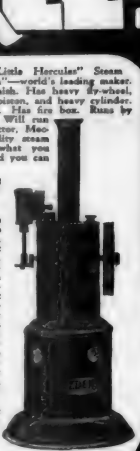

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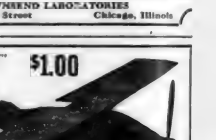

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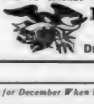

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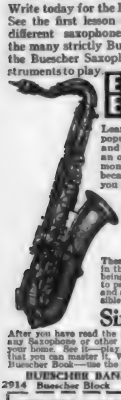

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Live wire salesmen are dropping everything else and flocking to Ve-Po-Ad. Ve-Po-Ad brings them quick money and lots of it. Shapiro out in California made $475 in one week! You can "clean up" too! Only 10 sales a day in spare time will bring YOU over $50.00 a week! No need to have previous sales experience—Ve-Po-Ad sells itself! If you are really interested in earning a steady, substantial income, write at once for full details of my MONEY-MAKING PLAN and FREE VE-PO-AD given to new Agents. Do it NOW—TODAY!

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1. What is the distinguishing characteristic of a tandem airplane? See page 102.

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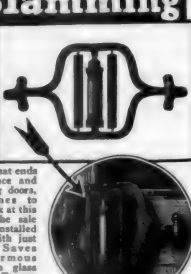

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Mail Coupon for FREE OFFER

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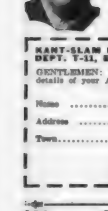

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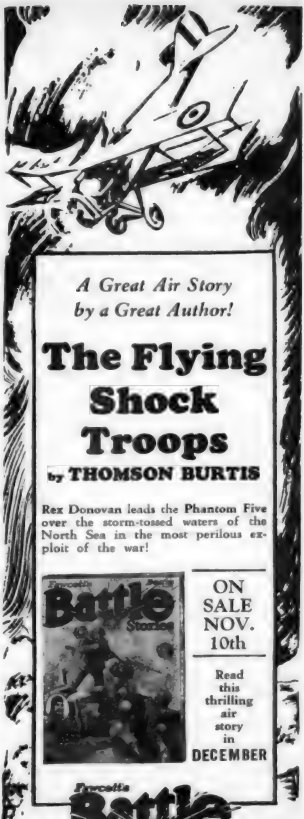
Golfer Almost Wins With Racquet

DRIVING a golf ball more than 200 yards with a tennis racquet, Theodore R. Pell, Newport, R. I., almost defeated his partner who was using regular golf clubs in a close nine-hole match recently. He made the round of the course with a score of 42, while his competitor counted two less with his pet clubs. Pell swung his racquet for all strokes except those that he made on the greens, where he employed a mashie. In driving off, he teed the ball on a special wooden stand in order that he could get a full swing at it with his racquet. His drives held their course surprisingly well. This type of match is expected to prove popular and already there have been reports of several such competitions from various parts of the country.



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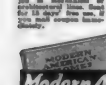

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Sets labeled and postpaid
Send for catalog

CRAFTSMAN WOOD SERVICE
S-717 E. 62nd Street CHICAGO

Model 2 Racing Type
24 in. wing spread $3
(West of Miss. $2.20)

$2.00

COMPETE and WIN with the "SILVER ARROW"

Beat the other fellows! With *this* plane you can confidently get into competition with boys who have other planes, and consistently win the contest. Here's a plane that *flies—flies!*—not just once or sometimes but repeatedly. Foolproof, trouble proof. It does not disappoint you. More flights, too, because it's durable—built to stand rough usage. Launches by hand or "taxies" and "takes off." Zooms way over the housetops on long continuous flights. Not a construction toy but a fully built plane. A few moments to assemble and it's ready to fly. Designed by Charles H. Grant, one of the foremost pioneer designers and builders of model airplanes in the United States. *That's* the reason! New expert construction. Wings and body of light Balsa wood reinforced with aluminum braces; aluminum propeller; strong elastic motor. Durable, stable and beautifully "finished." Three models: No. 1, Racing Type, 16 in. wing spread, $1.00; No. 2, Racing Type, 20 in. wing spread, $2.00; No. 31, Cabin Type, 23 in. wing spread, $2.50. (West of Miss. $1.10, $2.20, $2.75.) Get the plane that really flies—all the time. If your dealer hasn't the Kingsbury thriller, order direct. Kingsbury Mfg. Co., 106 M, Myrtle St., Keene, N. H.

KINGSBURY
MOTOR DRIVEN TOYS

Send 10c for this Eraser: A steel fire wheel from a Kingsbury Toy with

a "balloon" tire of solid crepe rubber. Set of four, 25c. Toy catalog free.

Action Suspense Thrills !

You get them all in

Startling Detective Adventures

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"UNDER COVER"

A Lemuel de Bra story that plunges you into the heart of the underworld with the law's most daring detective.

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Stories by
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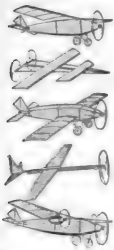
At All Newsstands 25c

Boys—LEARN TO FLY MODEL AIRPLANES

Join the CLINTON JUNIOR AVIATORS



Above are a few of the many model designs you will make under this Club Plan.

A. B. Clinton, 2nd, Senior Aviator and designer of successful model aircraft for over 10 years, invites you to join with thousands of other boys whom he has helped instruct.

Model Builders
It costs only $1.00 to join. Get started right away. This is the greatest dollar value ever offered to Junior Aviators.

MODEL BUILDERS—If you really want to learn how to build all types of model airplanes, here is the greatest proposition ever offered. Join the Clinton Junior Aviators. The total membership cost to you is One Dollar ($1.00) a year, and this is what we send you.

1. Twelve plans (regular price 25c each, $3.00 total value)—one each month for 12 months—each plan different, new, advanced in design, with full instructions for making and flying. We also enclose a news sheet with valuable information for model builders, pictures, instructions, news, etc.
2. A year's membership card—entitling you to full club privileges and the prize opportunities offered in regular bulletins.
3. A Discount Sheet with 12 coupons, good for 10% discount on all material and parts purchased thru the club.
4. Monthly prizes of $5 to $100 for the best models, best flights, photos and news, securing new members, etc. Under this club plan you can build more and better models at great savings in cost.

Can you imagine any greater value or any similar plan at any price that helps you to really study Aviation. Send in your membership right now and receive by return mail Plan No. 1—Junior Aviator Special Duration Scale Model, one of the neatest designs ever offered. Easy to construct. 20" wing, built-up 14" fuselage. Stays in the air for a minute and a half or more. Fine for flying either indoors or outdoors. Very light—weighs less than 1 oz. This plane is a wonder—you will rave about it.

Just fill in the coupon below—enclose $1.00 (check, bill or money order) and we do the rest. Let's get off to a flying start.

Special Coupon

Clinton Junior Aviators, c/o Clinton Toy Corp.,
North Haven, Conn. Dept. C1.
Dear Mr. Clinton:

I sure want to join your Junior Aviators Club. Here is my dollar. Put me down for a year's membership and rush me Plan No. 1 at once!

(Signed) .....

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The biggest value you ever saw advertised anywhere . . . . . .

Haven't you often wished that you could draw cartoons, illustrate some idea, sketch some pretty face, etc.? You can do all of these things. One of America's most famous Cartoonists and illustrators has developed a great, simple system for success in all branches of Commercial Art. This system has revolutionized the entire theory of drawing. It means that drawing can be as easy for you as writing—much simpler than learning shorthand, bookkeeping or typewriting. We are now placing this original system for learning Drawing, Art and Cartooning, consisting of 34 lessons with over 500 illustrations, within reach of every one. If you will devote a few hours each week to the Course WE ABSOLUTELY GUARANTEE that you will learn to draw and draw well before you have half finished the Course. If we fail to make this claim good, we will refund every cent paid us. By eliminating a large office force for answering correspondence, expensive catalogs, etc., we are enabled to make a price of $2.98, the cheapest price ever known for a high-grade, home study course. Learn to draw. It is a big asset, no matter what field you are in.

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Orders from outside the U. S. A. are payable $3.28 cash with order.

If you order the Course at once, we will include a drawing outfit, consisting of artists' pencils, pens, paper, erasers, thumb tacks, etc., enabling you to go to work without any additional cost.

2. How many passengers will the largest airplane in the world carry? See page 102.

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Earn $2000 to $5000 a Year or Have a Business of Your Own

Whether you want a job at good pay or a highly profitable business of your own—the Poultry Industry offers you more than any other. There's a shortage of poultry meat and eggs—a shortage of trained poultrymen. I'll train you quickly at home—to fill a good job in Poultry—and our FREE Students' Employment Dept. will help you get one!

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Dear Mr. Lamon: Send me your FREE Book, *"How to Raise Poultry for Profit."* I want to know more about my opportunity to make $2,000 to $5,000 a year, spare or full time.

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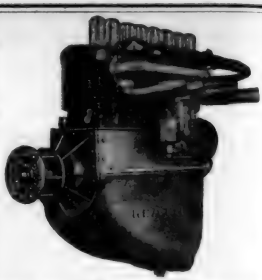

THE HEATH HENDERSON MOTORS were winners at the National Air Races. This successful light plane motor may be purchased as low as $190 remanufactured, or $325 brand new. Weighing only 115 lbs. complete they are also ideal for use on ice sleds, boats or wind buggies.

10c in stamps or coin brings large illustrated booklet describing this wonderful little motor.

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IF YOU like to draw, test your natural sense of design, proportion, color, perspective, etc., with our Art Ability Questionnaire. Learn if your talent is worth developing, and how much training you will need. You will be frankly told what your score is.

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Twenty years of Radio Experience. First to establish two-way amateur communication with Europe. Former Traffic Manager of American Radio Relay League. Lieut. Commander, U. S. Navy Radio and Decoder Radio Apparatus. Consultant Radio Engineer. Now in charge of R. T. I. Radio Training and you will like his friendly manner of helping you realize your ambition.

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Don't waste a minute. Find out what the great Radio industry, which has grown faster than the Automobile and Motion Picture business, has to offer you. Find out what other men are earning. SEE HOW EASILY YOU CAN GET STARTED. Get the facts about Radio, Television and the Talking Pictures, first hand, in the big R. T. I. FREE BOOK. Learn what this R. T. I. "Three in One" Home Training can do for you. Mail the coupon for FREE BOOK Now.

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R.T.I. *Training Brings Big Jobs Like These!*

$800 EXTRA MONEY IN 2 MONTHS

Your radio course has enabled me to earn over $800 in two months. This is all spare time work, as I have a permanent position with my father in our store. I give you all the credit for the above. —J. NOVAK, Jr.
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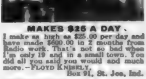
MAKES $25 A DAY

I make as high as $25.00 per day and have made $620.00 in 7 months from Radio work. That's not so bad when I'm only 19 and in a small town. You did all you said you would and much more. —FLOYD KNIGHT,
Box 81, St. Joe, Ind.



SALARY RAISED 33 1-3%

I am now Radio Service Manager for the B. N. Knight Supply Co., distributors for Sherwood Radio Receivers in Oklahoma, and Texas Panhandle, with an increase in salary of about 33 1-3% since I enrolled with your schools. —EARL F. LOVELL, 1009 N. 5th St., Oklahoma City, Okla.

The NEW BIG MOCAR

Tremendous Value

A Great Construction Outfit

A Sweet Flying Job

Aluminum Skeleton Construction

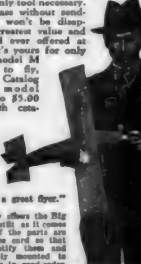
Only $3.50 Postpaid

30 In. Wing Spread
18 in. Fuselage
11½ in. Aluminum Ball Bearing Propeller

Boys—Never in your life have you seen such a wonderful buy as this Big Mocar aluminum construction model plane! Just think—a real aluminum construction outfit—with 2½ ft. wing spread and 18 in. fuselage—and how it does fly! Many special features, cambered wing construction, the big 11½ in. ball-bearing propeller, with a powerful long-running motor that carries this plane soaring and zooming, won't break up even after many flights.

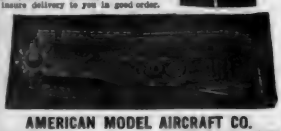
It is a real scale model—great fun to make—wonderful to fly. It will be your pride and joy. And you can fly it, too. It is made to stand the shocks. The Big Mocar construction outfit M-200 is complete with full instructions, mounted on board with all parts marked for easy assembly, rubber-tired wheels, covering material, cement and colors. Pliers only tool necessary.

Don't let a day pass without sending for this. You won't be disappointed. It's the greatest value and finest flying model ever offered at a popular price. It's yours for only $3.50 postpaid; model M made up ready to fly, $5.00 postpaid. Catalog showing many model planes from 75c to $5.00 (glider given with catalog) 10c.



The cut to the right shows Clarence Chamberlain looking over the Big Mocar. He says, "I like the aluminum construction. It is light and strong. The Mocar is a great flyer."

The illustration below shows the Big Mocar construction outfit as it comes to you. The names of the parts are plainly printed on the card so that you may easily identify them and all parts are securely mounted to insure delivery to you in good order.



AMERICAN MODEL AIRCRAFT CO.
Dept. G-11 NEW HAVEN, CONN.

1930 RADIO CATALOG

WHOLESALE RADIO SERVICE CO.

FREE! WRITE for this BIG 1930 RADIO CATALOG

Saves You Money on Sets and Parts

AGENTS and DEALERS wanted

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The NATURAL EYESIGHT SYSTEM saves sight, rebuilds eyes and makes victory over glasses possible. Now in use in 30 countries.

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Send for FULL and FREE information telling how thousands have solved their eye problems at home.

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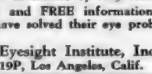

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PRICE 10c 3-25c no stamps

BIG FUN

BOYS You apparently see thru Clothes, Wood Stone, any object. See Bones in Flesh! FREE Pkg. radio picture films, takes pictures without camera. You'll like 'em. (1 pkg. with each 25c order).

MARVEL MFG. CO. Dept. 86, NEW HAVEN, CONN.

3. Can you name the man who first flew across the English Channel? See page 102.

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with this handsome sample case filled with Rawleigh Good Health Food Products, Flavors, Spices, Toilet Preparations, etc. Hundreds of families will buy from you. No experience needed—we show you how. Low prices. Liberal terms. Advertising literature and sales helps free. Good locations for 1500 men and WOMEN. Write

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The Only

Complete Interchangeable Power Shop - Improved Features - Exclusive Advantages

The right kind of tool-equipment is even more necessary than your own ability and desire. Now, you can do the things you long have wanted to—at home in your own modern motorized work shop—with this new, improved Waco Red Jacket Wonder-Shop. No other compares with it in its complete, interchangeable, power features, efficiency, exclusive advantages and quality.

Join the Happy Family of Waco Wonder-Shop Workers

Red Jacket Equipment is designed, tested, approved and guaranteed by Wm. L. Aylward, a nationally known craftsman and manufacturer who has developed his own life's hobby into a cooperative association of thousands of amateur and professional craftsmen. He invites you to join. He will instruct, guide and help you. A new zest in doing things awaits you.

The new 1930 Red Jacket Combination brings you the powerful Red Jacket Master Drill Motor with direct drive to the Waco Craftsman's Speed Turning Lathe (capacity 6" x 36"). Compound and 18" Rests, Tilting Top Mitre Saw with both depth and side gauges, Sander Disk, Scroll and Jig Saw, Improved Hand Saw, and all accessories for both portable and stationary power drilling, buffing, grinding and cleaning. Attaches to light socket. Converts your work bench into a complete private tool and machine shop—a complete chest full of electrically driven tools for your own private use.

Add New Special Equipment Any Time as Desired

Take your choice of four different assemblies to fit your present ideas and uses. Any time you wish to expand or add new power equipment, you can do so. The Waco Red Jacket Assortment is the most complete available anywhere. *A solid institution!* Waco Red Jacket is the pioneer—foremost in the field—sold only direct from the factory; not through stores.

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The choice of professional as well as home craftsmen. Red Jacket Shops are making money for their owners all over the country. You can be one of the Red Jacket Guild chain and market your products if you want under our new plans.

Buy It NOW On Easy Terms

Only $10 down. Easy monthly payments. Liberal discount for cash. No hardship to own a Waco Red Jacket. You can make it more than pay its way in profits if you want, as well as in the pleasure of doing things for yourself.

Make Them Yourself!

Special Craft Course FREE

All there is to know about handicraft methods, raw materials, carving, turning, sawing, finishing, etc., etc., is taught you by correspondence.

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If it is not what you want when you get it send it back.

Send NOW This Coupon for Interesting Literature

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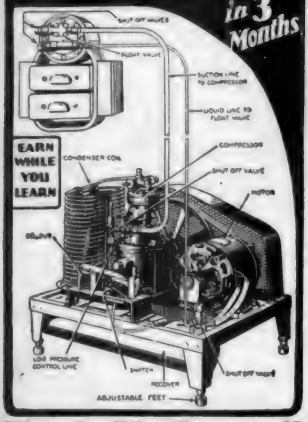
You Can Learn ELECTRIC REFRIGERATION in 3 Months



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Hundreds of thousands of Electric refrigerators in use. Thousands being installed day after day. Trained service and installation men are in urgent need in this new, fast growing industry. Big money awaits men who master the principles of Electric Refrigeration in the School of Engineering of Milwaukee—America's greatest Electrical school.

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Includes Electric Refrigeration, Applied Electricity, Merchandising, and Practical Mathematics. Some of the topics are: Physics and Chemistry of Refrigeration, Heat and Heat Transfer, General Theory of Refrigeration, Systems of Refrigeration, Household Compression Systems, Refrigerants, Household Absorption Machines, Refrigeration Cabinets, Installation and Repair, Maintenance, Troubles and Their Cures, Sales and Merchandising. All instruction is thoroughly practical. Splendid equipment and laboratories.

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Introduce the most wonderful new line guaranteed hosiery you ever saw. 128 styles and colors of men's, women's and children's finest pure thread Japanese silk, all fancy combinations of silk and lisle, novelty and sport, full fashioned, chiffon, etc. Must satisfy or new hose free.

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Our plan gives you fine silk hose for your own use. Write today for sales plan. We deliver or you deliver — suit yourself. No experience necessary. Spare time satisfactory. Credit given. Extra bonus. Mills of Minn. writes, "I made $120 in one week." Mrs. Gibb of Pa. writes "I sold $100 the first day." Mrs. Gleason, Ga., writes "In one day I made $23."

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AVIATION DEMANDS THEM!

GET INTO AVIATION WHEN and WHERE YOU ARE MOST NEEDED! Aviation demands experienced operators at once. Big pay jobs are open now. Lindbergh, Byrd, Chamberlain and other famous flyers say radio telegraphy is greatest aid to successful flying. YOU'VE SIMPLY GOT TO LEARN TELEGRAPHY SOONER OR LATER if you make aviation your career.

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4. Why do you want to win your wings? See page 102.

MODEL AIRPLANES

5c Brings you an interesting, illustrated booklet showing latest flying model airplanes, and model airplane supplies. The S. E. 5 Scout Plane pictured here is one of the best flying scale models that can be built. Made of featherweight Balsa and Bamboo parts. Wing span, 26 in.; fuselage, 20 in. Rises from ground by own power. Recorded flight, 45 seconds. Simple to construct with detailed blueprint and all necessary material.

Send for it today. $2.75 complete, postpaid. No stamps.

FREE Mail your order for this kit today and we will include in construction kit the above booklet. Filled with interesting information on other model planes and supplies. Mail your order today and get all this FREE!

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4844 Irving Park Blvd., Dept. A-12 Chicago, Ill.

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Now Bills to Conform With Small Size Currency

With these bills it is easy for a person of limited means to appear prosperous by flashing a roll of them at the proper time. By peeling off a genuine bill or two from the outside of the roll, the effect created will be all that can be desired. Prices, postpaid: 50 bills 20c, 150 for 60c, or $3.00 thousand postpaid.

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A solid die after being inspected by the company, is placed on the crown of a borrowed hat which the conjurer holds by the rim. An examined cover is now put over the die, and upon command, passes thru the hat and falls upon the floor. This is easy to do and so clever that no one can possibly discover the secret. Price complete 35 cents. Best make.

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Place in water, plant opens up and starts to grow in few minutes. Taken out it dries up and goes to sleep. Will put in water again. Price 10c, 3 for 25c, 75c dozen, postpaid.

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This mysterious box is useful in performing many card tricks. You ask two persons to each select a card from any ordinary pack of cards. One of the cards is now placed in this box and a second later when the box is opened the card has magically disappeared. The other card is now placed in the box and when it is again opened the first card appears and the other one is gone. You can make several cards disappear and at command they all appear at once. You can tear a card up and place it in the box and when you open the box again it will be found whole. All easy to perform after reading our simple directions. Price 25 cents. Better grade, made of highly finished wood. $1.25.

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Just like ordinary cigarettes. But such real startlers! The box contains ten genuine cigarettes of excellent quality. They appear so real, but when each

cigarette is about one-third smoked, the victim gets a very great surprise as it goes off with a loud BANG! A great mirth provoker yet entirely harmless. Price 25c box.

OAKS' CARD TEARING FEAT

A favorite with the late Alexander Herrmann and other magicians of note. The this seemingly impossibility, we offer five methods of working so that the merest neophyte may perform the trick with ease. Neat typed instructions giving five complete methods. Price 25c.

FREE—Our large die box trick when you have sent in orders amounting to $25 within one year.

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SEE PAGE 217

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The clowns in the border of this advertisement probably will all look exactly alike to you at first glance. But they are not all alike. Two—only two—are exactly alike. Can you find them? The difference may be in the color or markings in the hat, collar, nose, or top of the head. Find the twins. Look carefully. Be sure you have them—then answer at once. You may be the one who will solve this puzzle correctly and

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Just think. There are seven sedans and many other prizes to be awarded in this offer, including valuable radios, and so forth, totaling over $7,300.00.* Duplicate prizes paid in case of ties. Surely you can win one of these wonderful prizes.

NO MORE PUZZLES TO SOLVE. No word lists to write or make up—no number puzzles to trace. We do this to advertise and expand our business. No cost or obligation. Nothing to buy now, later or ever.

All who answer correctly can share in prizes or cash awards. Rewards for everyone taking an active part in this offer.

$500.00 For Promptness

Be prompt. Immediately, without delay, if your answer is correct, I will send you a certificate good for $500.00 if you are prompt and win first prize, and tell you why and how we make this unique advertising offer of free prizes. Just send the numbers of the twin clowns in a letter or on a post card. That's all. Send no money. All cars and other prizes are free, but be prompt.

*This offer guaranteed by a million-dollar concern.

FREE PRIZE JUDGE, 510 N. Dearborn St., Dept. [illegible], CHICAGO, ILL.

Anyone CAN LEARN
No talent or experience necessary. Fascinating work. Pays big money. Complete instruction book tells about Alphabets, Colors, How to Mix Paints, Show Cards, Window Board and Wall Signs, Ready made letters, Gilding, Tricks of the Trade, also gives 100 Alphabets and Designs. Book bound in flexible tint leather-gold edges, and four ball bearing Show Card Pens. Sent postpaid $3.00. C.O.D. 10c ex.
Ogilvie Pub. Co., 57 Rose St. Dept. 2, N.Y. City

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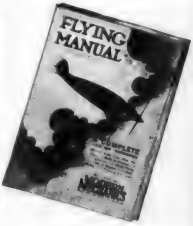

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MODERN MECHANICS AND INVENTIONS MAGAZINE
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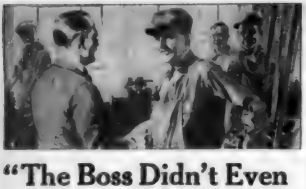

"The Boss Didn't Even Know My Name"

"He said my face was more or less familiar and he remembered seeing me around, but he didn't even know my name until the I. C. S. wrote him that George Jackson had enrolled for a course of home study and was doing fine work.

"'Who's George Jackson?' he asked. Then he looked me up. Told me he was glad to see I was ambitious. Said he'd keep his eye on me.

"He did too. Gave me my chance when Frank Jordan was sent out on the road. I was promoted over older men who had been with the firm for years.

"My spare-time studying helped me to get that job and to keep it after I got it. It certainly was a lucky day for me when I signed that I. C. S. coupon."

How much longer are you going to wait before you take the step that will bring you advancement and more money?

It takes only a moment to mark and mail this coupon and send it to the International Correspondence Schools at Scranton, but that one simple little step may change your entire life. Isn't it better to do this today than to wait a year or five years and then wish you had?

Mail the Coupon for Free Booklet

INTERNATIONAL CORRESPONDENCE SCHOOLS
Box 2328-C, Scranton, Penna.

Without cost or colligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the course *before* which I have marked X in the list below.

TECHNICAL AND INDUSTRIAL COURSES

☐ Architect	☐ Automobile Mechanic
☐ Architectural Draftsman	☐ Aviation Engines
☐ Building Foreman	☐ Plumber and Steam Fitter
☐ Concrete Builder	☐ Plumbing Inspector
☐ Contractor and Builder	☐ Foreman Plumber
☐ Structural Draftsman	☐ Heating and Ventilation
☐ Structural Engineer	☐ Sheet-Metal Worker
☐ Electrical Engineer	☐ Steam Engineer
☐ Electrical Lighting	☐ Marine Engineer
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☐ Electric Lighting	☐ R. R. Positions
☐ Reading Blueprints	☐ Highway Engineer
☐ Telegraph Engineer	☐ Chemistry
☐ Telephone Work	☐ Pharmacy
☐ Mechanical Engineer	☐ Coal Mining Engineer
☐ Mechanical Draftsman	☐ Navigation Engineer
☐ Machine Shop Practice	☐ Iron and Steel Worker
☐ Toolmaker	☐ Textile Overseer or Supt.
☐ Patternmaker	☐ Cotton Manufacturing
☐ Civil Engineer	☐ Woolen Manufacturing
☐ Surveying and Mapping	☐ Agriculture ☐ Fruit Growing
☐ Bridge Engineer	☐ Poultry Farming
☐ Gas Engine Operating	☐ Mathematics ☐ Radio

BUSINESS TRAINING COURSES

☐ Business Management	☐ Business Correspondence
☐ Industrial Management	☐ Show Card and Sign Lettering
☐ Personnel Management	☐ Stenography and Typing
☐ Traffic Management	☐ English
☐ Accounting and	☐ Civil Service
☐ C. P. A. Coaching	☐ Railway Mail Clerk
☐ Cost Accounting	☐ Mail Carrier
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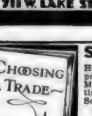

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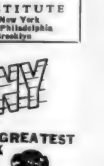

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Do *you* want to be able to put the gloves on with any of your pals, and more than hold your own? Do *you* want to know how to defend yourself if attacked? Do *you* want to be able to use the blows and guards developed by the top-notchers of the ring?—the Benny Leonard Triple Blow, the Jack Dempsey Triple, the Mike Donovan Leverage Guard, etc.? In short, do *you* want to be a *good* boxer in a very short time and at very little cost?

The Marshall Stillman Shortcut System makes it easy for you to learn boxing. In this unique course the lessons are practiced right in your own home before a mirror. You do not have to submit while learning, to the punches of someone who knows far more about boxing than you do. We start you with simple movements you already know—reaching out your hand for a coin, the breast stroke in swimming, etc., and step by step lead you into similar movements in boxing. Before you realize it, we have you striking scientifically, guarding, ducking, feinting, side-stepping, etc., just as though you had a real opponent before you.

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Lost in the Air

(Continued from page 77)

pilots became convinced that their compasses were in error or did not allow for a wind that drifted their planes far off their courses.

There is no doubt but that Connely and Waterhouse gave up flying by compass and followed what they believed to be a course to the west. Their last message states, "Hit the coast, turned to our right and flew up coast." Actually they hit the Gulf of California and flew down the gulf. They thought that they were flying north along the coast and they were actually flying south, farther and farther away from San Diego. It was a mistake, error in judgment or what you will. They mistrusted their compass when it probably would have carried them to their destination.

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6. How many flying hours required for a transport license? See page 102.

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Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the course *before* which I have marked X in the list below:

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☐ Architect	☐ Automobile Mechanic
☐ Architectural Draftsman	☐ Aviation Engines
☐ Building Foreman	☐ Plumber and Steam Fitter
☐ Concrete Builder	☐ Plumbing Inspector
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☐ Structural Draftsman	☐ Heating and Ventilation
☐ Structural Engineer	☐ Sheet-Metal Worker
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☐ Electrical Contractor	☐ Marine Engineer
☐ Electric Wireman	☐ Refrigeration Engineer
☐ Electric Lighting	☐ R. R. Positions
☐ Reading Shop Blueprints	☐ Highway Engineer
☐ Telegraph Engineer	☐ Chemistry
☐ Telephone Work	☐ Pharmacy
☐ Mechanical Engineer	☐ Coal Mining Engineer
☐ Mechanical Draftsman	☐ Navigation ☐ Assayer
☐ Machine Shop Practice	☐ Iron and Steel Worker
☐ Toolmaker	☐ Textile Overseer or Supt.
☐ Patternmaker	☐ Cotton Manufacturing
☐ Civil Engineer	☐ Woolen Manufacturing
☐ Surveying and Mapping	☐ Agriculture ☐ Fruit Growing
☐ Bridge Engineer	☐ Poultry Farming
☐ Gas Engine Operating	☐ Mathematics ☐ Radio

BUSINESS TRAINING COURSES

☐ Business Management	☐ Business Correspondence
☐ Industrial Management	☐ Show Card and Sign Lettering
☐ Personnel Management	☐ Stenography and Typing
☐ Traffic Management	☐ English
☐ Accounting and C. P. A. Coaching	☐ Civil Service
☐ Cost Accounting	☐ Railway Mail Clerk
☐ Bookkeeping	☐ Mail Carrier
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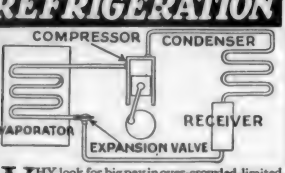

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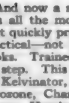

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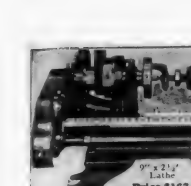

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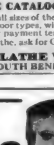

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Of Modern Mechanics and Inventions, published monthly at Minneapolis, Minnesota, for October 1st, 1929.
State of Minnesota, County of Hennepin.

Before me, a Notary Public in and for the State and county aforesaid, personally appeared W. H. Taylor, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the Modern Mechanics and Inventions and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers, are:

Publisher: W. H. Fawcett, Robbinsdale, Minnesota.

Editor: Roscoe Fawcett, Robbinsdale, Minnesota.

Managing Editor, None.

Business Managers: W. H. Taylor, Robbinsdale, Minnesota.

2. That the owner is: (If owned by a corporation, its name and address must be stated and also immediately thereunder the names and addresses of stockholders owning or holding one per cent or more of total amount of stock. If not owned by a corporation, the names and addresses of the individual owners must be given. If owned by a firm, company, or other unincorporated concern, its name and address, as well as those of each individual member, must be given.)

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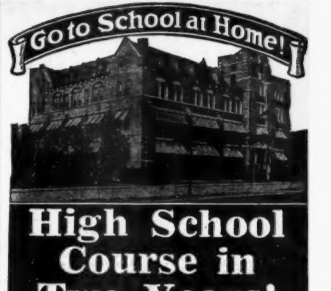
5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is.....(This information is required from daily publications only.)

W. H. Taylor, Business Manager.

Sworn to and subscribed before me this 1st day of October, 1929.

LEON PILON, JR.,
Notary Public, Hennepin County, Minnesota
(SEAL) My Commission expires August 6, 1935.



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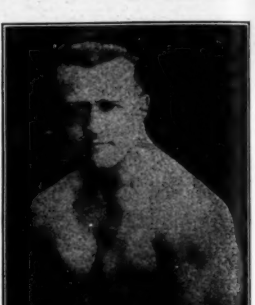

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